Luís Pedro Santana Pereira

Master in Industrial Engineering and Management

Support in Decision-Making under Uncertainty:

A Project Risk Assessment Tool Development and Supplementary Advances

Thesis submitted in the fulfilment of the requirements for the Degree of
Master in Industrial Engineering and Management

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FACULDADE DE CIÊNCIAS E TECNOLOGIA
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By

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Abstract

A foremost dispute that persists on the contemporary world's agenda is change. The on-going social/technological/economic changes create a competitive and challenging environment for companies to endure. To benefit from these changes, world economies partially depend on emerging Small and Medium Enterprises (SMEs) and their adaptability skills, and subsequently the development of an integrated capability to innovate has become the prime strategy for most of SMEs to subsist and grow.

However, innovation and change are always somewhat bonded to an inherent risk development, which subsequently brings on the necessity of a revision of risk management approaches in innovative processes, whose importance SMEs tend to disregard. Additionally, little efforts have been made to improve and create empirical models, metrics and tools to assist SMEs managing latent risks in their innovative projects. This work seeks to present and discuss a solution to support SMEs in engaging on systematic risk management practices, which consists on an integrated risk assessment and response support web-based tool - Spotrisk® - designed for SMEs.

On the other hand, an inherent subjectivity is linked with risk management and identification processes, due to uncertainty trait of its nature, for each individual perceives situations according to his own idiosyncrasy, which brings complications in normalizing risk profiles and procedures. This essay aims to bring insights concerning the support in decision-making processes under uncertainty, by addressing issues related with the risk behavior character among individuals. To address such issues, subjects of neuroscience or psychology are explored and models to identify such character are proposed, as well as models to improve presented tool.

This work attempts to go beyond the restrictive aim of endeavoring on technical improvement dissertation, and in embraces an exploratory conceptualization concerning micro, small and medium businesses' traits regarding risk characters and project risk assessment tools.

Keywords: Project Risk; Risk Assessment Tools; SMEs; Decision Making; Uncertainty.

Resumo

A mudança é tida como uma das mais relevantes batalhas contemporâneas. As mudanças existentes nos ramos social/tecnológico/económico geram ambientes competitivos e desafiantes para empresas. Para beneficiar destas mudanças, a economia global depende parcialmente das capacidades de adaptação das pequenas e médias empresas emergentes (PMEs), levando estas a adotar a integração de uma capacidade de inovação como estratégia principal de desenvolvimento.

No entanto, a inovação e a mudança estão intrinsecamente ligadas a um risco emergente, o que remete a uma necessidade de revisão de processos de gestão de risco em processos de inovação, tendencialmente desconsiderados por PMEs. Além disso, poucos esforços têm sido feitos para melhorar e criar modelos empíricos, métricas e ferramentas para apoiar PMEs a gerir os riscos latentes dos seus projetos de inovação. Este trabalho pretende apresentar e discutir soluções para apoiar PMEs em efetivar práticas disciplinadas de gestão de risco, através de uma ferramenta web de suporte à análise de riscos de projetos para PMEs.

Por outro lado, existe uma subjetividade inerente aos processos de identificação e gestão de risco, devido à natureza incerta do seu carácter, pois cada individuo tem a sua própria perceção de cada situação consoante a sua índole idiossincrática subjacente, o que traz complicações em normalizar perfis e processos de risco. Este trabalho visa trazer clarificações acerca dos processos de tomada de decisão ante da incerteza, abordando questões relacionadas com os diferentes carácteres individuais de comportamento para com o risco. Para endereçar essas questões, temas da neurociência ou psicologia são explorados e modelos são apresentados, bem como aspetos para melhorar a ferramenta apresentada.

Este trabalho procura ir além do objetivo restritivo de uma dissertação de natureza técnica, e em abarca novas conceituações de carácter exploratório, relativamente a singularidades referentes a perfis individuais de risco e a ferramentas de gestão de risco de projetos.

Termos-Chave: Risco de Projetos; Ferramentas de Gestão do Risco; PMEs; Tomada de Decisão; Incerteza.

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1. Introduction

1.1. Context of Research

As Heraclitus once said “Nothing endures but change” (Laertius & Yonge, 1853). The one subject that persists and upsurges on the world’s agenda is “change” itself, along with inherent concepts such as innovation or adaptation. The on-going technological advances taking place during the last decades proved that the world is quickly heading to a global knowledge-based economy (Yun-hong, Wen-bo, & Xiu-ling, 2007). Such changes and advances dragged all kinds of enterprises to held on an exceedingly competitive and challenging environment in order to endure and subsist (Emmenegger & Laurenzi, 2012).

Out coming from this global condition, enterprises face rising difficulties. However opportunities emerge within each change almost every day. To benefit from these changes and profit with emerging opportunities, world economies partially depend on innovative Small and Medium Enterprises (SMEs) and their adaptability skills (Yang & Man-li, 2010). Therefore, in order to overcome the swift technological advances, global competition, product variety expansion and to predict and positively respond to changes, the development of an integrated capability to innovate has become the prime strategy for most of SMEs (Ebrahim, Ahmed, & Taha, 2010).

Innovation and the implementation of innovative projects are indisputably solid forces for socio-economic development and its integration in enterprises represents a factual indicator for national and international competitiveness measurement (Di, 2010). Also, it is known to be considered as a decision factor of a project’s success or failure, the use of formal and systematic innovative processes (Griffin, 1997), such as the new product development (NPD) approach. Innovation can be stated as the core capability to master and maintain holistic value, generating new dynamics in which opportunities of change are exploited and new ideas emerge (Jin, Hewitt-Dundas, & Thompson, 2004). However, many definitions were rendered to tally the concept of innovation and a common ground among each definition sees innovation as the action or process of creating a new method or idea (Black, 2003), as well as its exploration and commercialization (Massa & Testa, 2008).

Thus, this “newness” trait, associated to innovative processes, is always somewhat bonded to an inherent risk expansion, which subsequently brings on the necessity of a revision of risk management approaches in innovative processes (Vargas-hernández & García-santillán, 2011). Literature review however shows that, despite operating in the same demanding environment as large enterprises, SMEs tend to disregard the importance in managing risks, contrarily to their larger counterparts who invest time and resources in order to engage in suitable risk management practices (Brancia, 2011; Jayathilake, 2012; Smit & Watkins, 2012).

This contempt in SMEs is evidently linked to their customary limitations regarding resources or availability (Freel, 2005). The lack of capital resources frequently constrains SMEs in acquiring

human resources or services to supplement the collaborators or managers who are fully occupied with immediate operational complications, which drives SMEs to a deficiency of attention in long-term strategies and to a disregard of risk management practices, remaining paralyzed in endless coming operational problems and difficulties (Vos, Keizer, & Halman, 1998). Thus far, the percentage of worldwide SMEs stands above 97% (Brancia, 2011), and yet little efforts have been made to improve and create empirical models, metrics and tools to assist SMEs managing latent risks in their innovative projects (Aleixo & Tenera, 2009). Therefore, since the purpose of engaging in risk management practices is to enable innovation instead of strangling it, SMEs require a strategy of early risk diagnosis and management, rather than a risk avoidance strategy (Keizer, Halman, & Song, 2002).

Furthermore an inherent subjectivity is linked with risk management and identification processes, due to uncertainty trait of its nature (Kahneman, Slovic, & Tversky, 1982). Each individual perceives situations according to his own idiosyncrasy, which brings complications in normalizing risk profiles and procedures (Williams & Noyes, 2007). While performing decisions under uncertainty, mental tools or heuristic principles are employed to reduce the complexity of the probability assessment task and to convert predicting values into simpler judgmental operations. These heuristics are extremely useful tools but they can lead to serious and systematic errors, called biases. The use of heuristics and biases and its reliance differs according to each individual, and the degree to which these mental tools are accessed may significantly explain the existing variations in decision-making and risk attitude among individuals. It is accepted that attitude towards risk can be divided into a) attitude towards perceived-risk and b) risk perception. Several documents among the literature review assent that attitude towards perceived risk is consistent among individuals, while risk perception shows systematic differences. This implies that risk perception is the key variable that defines an individual's risk attitude.

Therefore, since entrepreneurs (linked to SME's management) are widely recognized as risk-takers and sharp individualists, it is appropriate to assert that they generally retain a lower perception of the general risk entailed over their activities, which subsequently suggests that they are driven by a greater use and reliability over biases and heuristics among their decisions, than what managers with less entrepreneurial character tend to do. Since these mental shortcuts in decision-making consist in a non-rational approach, some investigation was performed among neuroscience studies, which brings evidence that comprehensive and rational decision-making strongly depends on an accurate emotional processing and that conscious knowledge alone is not enough to make advantageous decisions. António Damásio introduced the notions that the VM cortex connects the emotions generated by the "primitive" brain to the stream of conscious thought, producing "hunches" and "gut feelings" that can potentially bias an individual. Thus, it is hypothesized that some of the methods used by neuroscientists among their studies can represent models to measure the degree with which an individual is predisposed to access and rely on their heuristic principles and consequent biases while performing decisions, as well as to quantify an individual's perception of risks.

Concerning there remark, the literature review the literature review provided had the purpose to provide a rich and solid foundation of the models explored, with the aim to support the best risk assessment practices among micro, small and medium enterprises.

1.2. Scope and Objectives of the Research

This work was projected to complete the graduate program of master in industrial management engineering at Universidade Nova de Lisboa, Faculdade de Ciências e Tecnologia, as well as to undertake a project of a R&D company in the Photovoltaic Energy Industry. This ambitious exertion, developed to assist micro, small and medium enterprises, presents a tool, a practical methodology and particular models to support risk assessment processes.

It is accepted amongst several researchers that applying risk management practices at early stages of a project is as useful as it is difficult, since the outcomes of handling risk early on are substantial superior than to manage the risks at the time of occurrence, and since projects hardly proceed accurately according to the plan. Furthermore, it is also recognized that risk profiles differ according to each individual and even that their interpretation of what is a risk changes from each person.

Hence, this work seeks to present and discuss a solution to support SMEs in engaging on systematic risk management practices, which consists on an integrated risk perception, management and response web-based tool - Spotrisk® - designed for small, medium businesses and startup enterprises. It is intended that this tool may provide these businesses the opportunity to perform an early stage risk assessment of their internal projects, through a web-based platform and cloud database, where a specific goal oriented questionnaire is responded and results are gathered.

Moreover, this work aims to bring insights concerning the support in decision making processes under uncertainty, by addressing issues related with risk attitude and risk perception among individuals as well as its linkage with the distinctive character of an entrepreneurial profile. To address such issues, the subject of neuroscience will be explored. Accordingly, models to identify such character will be proposed, as well as models to improve presented tool. Despite being focused on a technical improvement model, this work goes beyond of such restrictive objective, and it endeavors on an exploratory conceptualization concerning micro, small and medium businesses' traits regarding risk characters and risk assessment tools.

Since very few studies explore such subjects, this dissertation aims to stand as a reliable document that relates engineering and project management studies with psychology and neuroscience subjects, in order to generate future research on a spectrum of fields that are indisputably related and unquestionably important.

1.3. Research Methodology

This research work was conducted throughout an extensive literature review of both scientific papers and books. The literature review was executed by consulting documents with a vast difference concerning the years of publication, in order to assure a whole sphere of understanding of all areas investigated and as well due to the fact that many of the original sources derive from documents generated several decades ago.

This work aims to bring insights concerning the support in decision making processes under uncertainty, by addressing two foremost issues: individual's risk behavior and project risk management support tools, as illustrated in Figure 1.

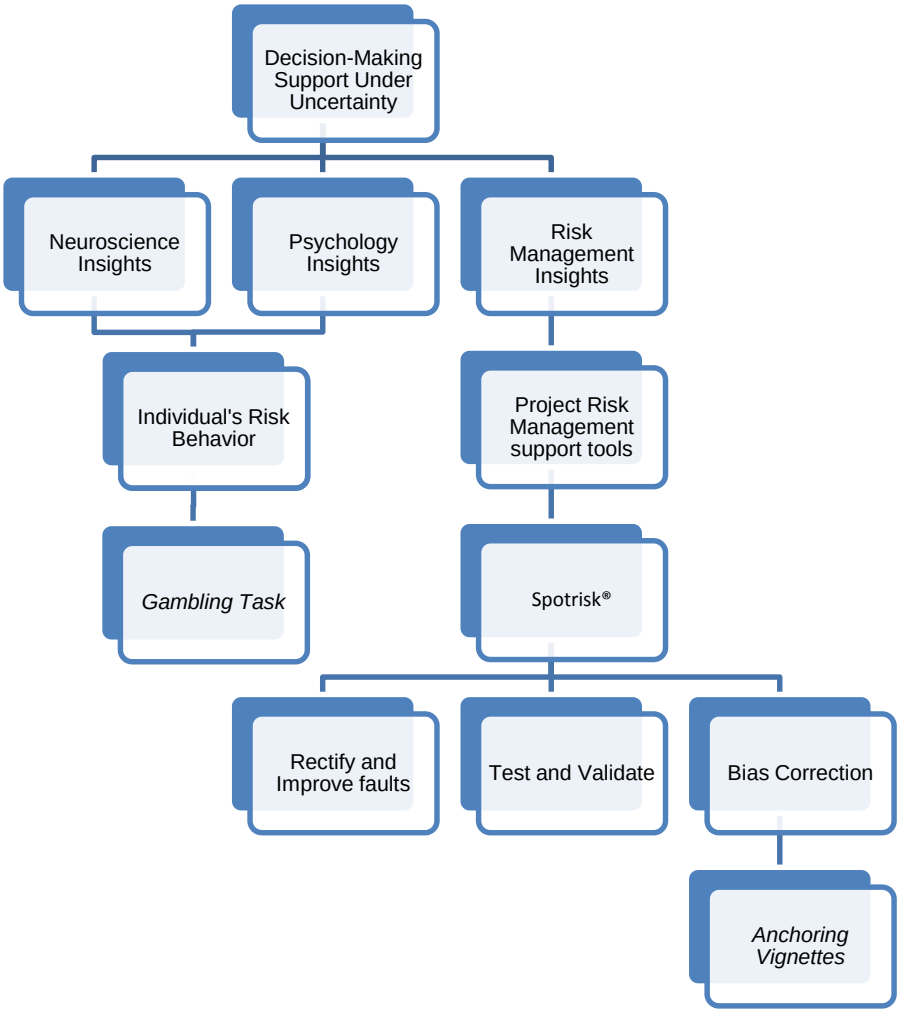


Figure 1.1 Proposed methodology to support decision making under uncertainty.

Concerning the first issue, related literature review was brought, regarding both neuroscience and psychology studies, as well placed forth a hypothesis of introduction of an exploratory model of measurement of an individual's risk behavior. In order to attempt such model's application – *Gambling Task* – nineteen participants executed a series of tasks that generated outputs to be studied later on.

Regarding the second foremost issue, it was presented a tool to support decisions in projects along micro, small and medium businesses, as well as a hypothesis to improve and enhance the same tool to be tested. In such tool, project team members are inquired concerning several aspects of a specific project, in order to perform a risk statement. Hence, inquiries under the form of survey were performed in order to examine and validate the tool, as well as an external disclosure under the form of workshop. Additional queries were made in order to apply *Anchoring Vignettes*, a model to reduce the idiosyncrasy among surveys, where the same nineteen participants previously stated were called upon to share their contribution again.

1.4. Thesis Structure

This dissertation is organized in five different sections. This present section partakes an introductory trait, which answers to ***what*** is risk under uncertainty, ***why*** is it appealing to develop a dissertation concerning this topic, and ***how*** will the purpose of this dissertation be accomplished.

The second section aims to scrutinize the theory necessary to hypothesize the conjectures strived along the present essay, as well as to find a basis to develop corresponding models to assess the constraints exposed in order to accomplish the purposes projected. It is divided in 3 foremost segments. The first addresses decision-making notions regarding the inherent uncertainty in the decision-making process and examines its roots and sources among the foundations of psychology. The second segment explores the matter of individual's risk behavior and digs along the subject of neuroscience. The last segment aims at existing processes of innovation and risk management within small and medium businesses, as well as certain characteristic mannerisms around these organizations, certain existing methodologies and several tools currently used. Additionally, it introduces the presented risk support tool, as well as certain procedures and models to improve it.

In the third section hypotheses are conjectured and is proposed a methodology to pursuit and develop models to support decision making under uncertainty, which is based on two segments: Individual's risk behavior and risk management support tools and processes. On the first segment is explored the model of *Gambling Task* to quantity an individual's risk profile, while on the second segment are explored methods and models to improve and endorse Spotrisk® tool, expressly with *Anchoring Vignettes*.

On the forth section the models previously presented are applied, the tool's methods are explained and the hypothesis conjectured are exposed under enlightenment of the generated result. Additionally, outcomes are analyzed among five different segments: Application of

Gambling Task, Rectification and improvement of technical faults from Spotrisk®, validation of Spotrisk®, application of *Anchoring Vignettes* and verification of correlation between *Gambling Task* and *Anchoring Vignettes'* specific outcomes.

The last chapter presents the main conclusions and contributions from this essay. It also suggests future research to endure the exploratory research and exertion developed, as well as potential applications from the approaches endeavored.

2. Decision Making

For decades, conjectures were made in decision-making literature asserting that individuals generally perceive risk the same way when contemplating identical decision-making scenarios, presuming that individuals were fully rational, profit-maximizing, information processors. However studies show that complex managerial decisions can be a function of behavioral factors (Simon, Houghton, & Aquino, 1999).

General decisions, especially the most difficult ones, are built on beliefs concerning the likelihood of uncertain events, such as: *What should be my next investment?* Or *when should I request a raise?* Many of these decisions can outcome from a series of complex analysis of numbers and probabilities, representative of events and indicators, transfigured into odds and subjective tendencies (Kahneman, Slovic, & Tversky, 1982).

In the questionnaire further presented on this essay, as well as in any regular day's labor, project team members are confronted with general questions that lead to subjective answers. The subjectivity of this type of answers lays on the existing idiosyncrasy of each individual, i.e. the typical behavior or peculiar way of thinking from each person. Each answer varies according to an uncertain chain of mental processes, which commonly culminate categorically on uncertain behavioral labels, such as overconfidence or aversion (Williams & Noyes, 2007), which renders the uncertainty element as being an inherent factor within decision making processes.

2.1 Decision-Making Within Uncertainty

Uncertainty is an ample term, employed to integrate a diversity of concepts, used for several kinds of purposes. It may arise for many different reasons, such as incomplete information, like "who will be the prime minister in the year 2050?", or divergences between information sources, such as "what was the 1987 Soviet defense budget?". Uncertainty may arise from linguistic imprecision, like "what exactly is meant by: too much time?" It may refer to variability, like "what is the flow rate of Guadiana River?" Uncertainty is a well-known variable that we as individuals have accepted and retorted with brain tools to deal with, in order to perform necessary decisions within uncertain scenarios. Even where we have apparent complete information, we may be uncertain because of approximations introduced. The variety of types and sources of uncertainty, along with the lack of agreed terminology, may produce significant confusion (Morgan, Henrion, & Small, 1992).

Morgan, Henrion and Small state that uncertainty, in empirical quantities, can arise from a variety of different kinds of sources, being consequently defended that the most appropriate method to characterize uncertainty, in order to further control it, generally depends on the particular kind of source. Thus they found helpful to classify uncertainty in empirical quantities in terms of the different kinds of source from which it can arise, such as statistical variation, variability, inherent randomness, disagreement, approximation, subjective judgment, linguistic imprecision, etc.

(Morgan, Henrion, & Small, 1992), from which the most pertinent, according to this work's agenda, are illustrated on Figure 2.1.

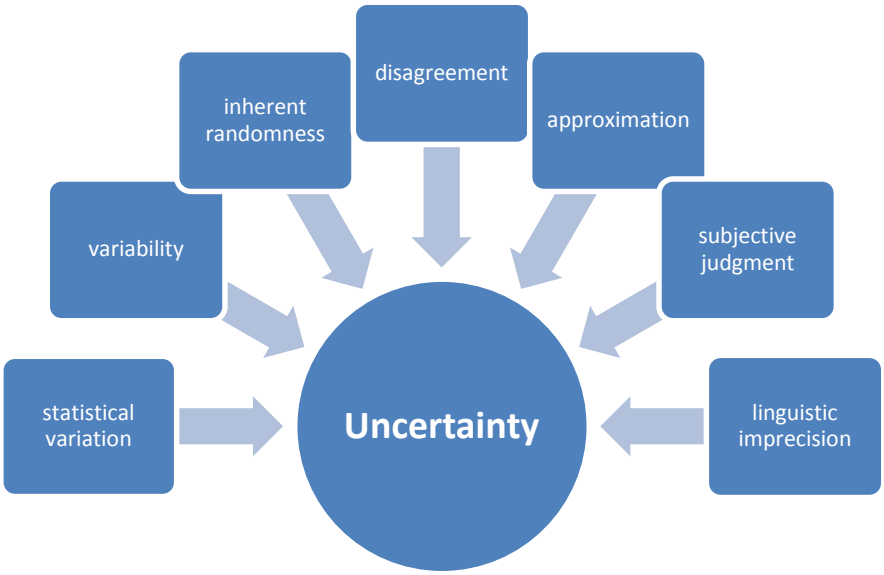


Figure 2.1 Sources of uncertainty according to Morgan et al. (1992).

This work implicates the analysis and engagement on a survey, thus two sources of uncertainty are considered as being the most adequate and relevant within our study's framework, since its concepts are inwardly connected with the uncertainty engendered in the act of answering to a risk survey. These sources are subjective judgment and linguistic imprecision

2.1.1 Subjective Judgment

Human beings make choices by assessing alternatives regarding benefits on a basis of accessible information. The most attractive alternative in terms of goals is patently the one to be chosen. Of course that in order to perform choices, the human brain may need to deal with a vast range of variables that may induce a great degree of subjectivity (Morgan et al., 1992)

To perform these choices under an uncertain variability, subjective probabilities play an important role. The decisions we make are usually based on our judgments of the likelihood of uncertain events, such as success in a new job or the outcome of an election (Kahneman & Tversky, 1972).

The subjective assessment of probability resembles to the subjective assessment of physical elements, such as distances or sizes. Each of these judgments is based on information of ambiguous validity and subjective legitimacy, because they are processed according to what is known as heuristic rules (Kahneman et al., 1982).

In addition, since it stands as the groundwork of the present assay, it is known that the conformity of the assessment of a certain project's aspects and conditions relies on a correct assessment of

the internal and external factors that are associated with it, which are easily unknown or uncertain. This matter leads several times to a probability issue (Blindenbach-Driessen, Van Dalen, & Van Den Ende, 2010).

2.1.2 Linguistic Imprecision

In everyday conversation are frequently mentioned events or quantities with imprecise or vague language. Indeed, the same occurs among professional writing. For example, the proposition that "My project has potential" is undetermined, because it doesn't possess any specification regarding the objective nature of such potential (Morgan et al., 1992).

Some literature has considered the relation between probabilities expressed by numbers and probabilities expressed by verbal phrases, such as "quite likely" or "highly improbable", and this phrasal approach is recognized to be extensively more comfortable to people than what numbers seem to be (Beyth-Marom, 1982; Wallsten et al., 1986). Unfortunately, there is significant discrepancy in the way different individuals interpret phrases, being that each interpretation is context-dependent. Saying that rain is "fairly likely" to fall tomorrow means something rather different in London than in Arizona. Likewise, the quantitative implications of "My project has potential" are seriously affected by the acknowledgement of specific information regarding the project and its adjacent conditions (Morgan et al., 1992).

One situation which is typically permeable to linguistic imprecision is the application of surveys or questionnaires, especially the ones applied to more than one country or cultures. Survey questions bring advantages, such as offering a direct measure of individual attitudes and avoiding the need to recover behavioral parameters by making restrictive identifying assumptions. They also bring the possibility of reaching very large samples at a relatively low cost (Ding, 2010). However, a potentially disadvantage of using survey questions is that they might not predict actual individual's behavior. Still, some work has been developed in order to validate survey measures by combining large surveys with real field experiments, ending up with statistical power that provides confidence and reliability to the measures (Ding, 2010; Falk, 2005).

Dohmen et al. (2005) conducted a study in Germany regarding individual risk attitudes, primarily using a survey with a sample of 22.000 individuals, where they first asked about their "willingness to take risks" on an 11-point scale, in general and in specific contexts such as car driving, financial matters, sports and leisure, career, and health (Pereira, Tenera & Wemans, 2013). Secondly respondents also indicated their willingness to invest in a hypothetical lottery with explicit stakes and probabilities, being possible to calculate a parameter describing the curvature of the individual's utility function (Falk, 2005). Then it was carried out a complementary field experiment based on a representative sample of 450 individuals where they actually participated on a lottery with real prizes. The results showed that the survey measures could predict actual risk-taking behavior in the field experiment (Falk, 2005).

In addition, Ding et al. (2010) developed their work in a similar way but with a slightly different approach, challenging Chinese respondents in a hypothetical lottery game, where the possibility to win 1,000 yuan was 10%, and asking the respondents how much would they be willing to pay, at most, to buy a lottery ticket. Then, they changed the game into asking how high a probability should be at least, for the respondents to take the lottery ticket rather than 100 yuan in cash. In the end, similarly to Dohmen's work, a field experiment took place, where similar results and similar conclusions were drawn, pointing to a survey's positive prediction of the results showed on the field experiment (Ding, 2010).

Similar studies and conclusions were headed by Fausti and Gillespie (Fausti & Gillespie, 2006). The majority of these studies converged into putting forward two methods: asking for the reservation price of a hypothetical lottery ticket and, in addition, asking individuals to rate themselves on a scale of risk attitude, either in general or for specific domains of life (Betz & Weber, 2002; Ding, 2010; Falk, 2005; Fausti & Gillespie, 2006).

2.1.3 Heuristics & Biases

In order to perform a decision within uncertain events people usually rely on a limited number of heuristic principles, which reduce the complexity of the task of estimating probabilities and predicting values into simple judgmental operations (Kahneman et al., 1982). Heuristics are simplifying strategies performed unconsciously in the human brain, in order to provide a simple way of dealing with the complexity of the real world. In other words, heuristics are shortcut processes that the human being developed in order to dismiss analytical processes to make decisions. Examples of heuristics are the processes to estimate a person's height without measuring it, or to instantly tell the velocity of a car without calculating it (Kahneman et al., 1982). In general these heuristic rules are quite useful but sometimes they lead to severe and systematic errors called biases, usually found in the intuitive judgment of probability (Kahneman et al., 1982).

A cognitive bias is a pattern of deviation in judgment, where inferences concerning other people and situations may be drawn in an illogical manner. Individuals create their own "subjective reality" from their perception of the input (Haselton, Nettle, & Andrews, 2005). An individual's construction of reality, not the objective input, may dictate their behavior. Thus, cognitive biases may sometimes lead to perceptual distortion, inaccurate judgment, illogical interpretation, or what is broadly called irrationality (Kahneman & Tversky, 1972).

Therefore, heuristics and biases are intimately related with individual's behavior in all sorts of circumstances, including evidently the individual's conduct under the task of assorting a project's characteristics upon the answering of a goal oriented questionnaire. There are several heuristics and conceptual ramifications from what it is considered to be the heuristic's conventional approach. Nonetheless, the three foremost and most relevant judgmental heuristics, brought in by Tversky and Kahneman, are representativeness heuristic, availability heuristic and adjustment & anchoring heuristic (Kahneman et al., 1982).

The representativeness heuristic consists on a mental shortcut used when making judgments under uncertainty where it is assorted the probability to which an object X is similar to a class Y, and hence the probability that X belongs to Y. In other words it is a mental process in which a situation is judged based on how similar the prospects are to the prototypes that the person holds in his/her mind (Kahneman et al., 1982). Let's comprehend an example given by Kahneman: "Steve is very shy and withdrawn, invariably helpful, but with little interest in people, or in the world of reality. A meek and tidy soul, he has a need for order and structure, and a passion for detail". Employ the representativeness heuristic to categorize what is more likely to be his occupation, from a list of different professions, let's say pilot, salesman, comedian or librarian. The representativeness heuristic drives us to assort that Steve's description highly matches the librarian occupation, i.e. the degree to which Steve's description is representative of the stereotype of a librarian is high (Kahneman et al., 1982).

The availability heuristic is summoned when a person assesses the probability of an event and further performing a judgment by the ease with which occurrences or examples can be brought to mind. In other words, the easier it is to consider instances of class Y, the more frequent we think that such is the case. Examples can be drawn upon this concept, such as the process of assessing the risk of heart attack among middle-aged people by recalling such occurrences among one's acquaintances or the probability that a given business venture will fail by recalling various difficulties previously encountered (Kahneman et al., 1982).

Anchoring heuristic occurs when a person makes a specific estimate by starting from an initial value that will directly affect the final deliberation. Even when considerable adjustments are made after the early initial value, the anchoring heuristic finds up a logical path that will yield the final answer. For example when a psychiatrist is studying the clinical condition of a patient, it can occur that he/she grabs too much on a specific detail of the patient's life or personality, that will clutch a biased clinical profile. Even when other data regarding the patient is provided, this heuristic can hold to a logic trail of arguments that supports the initial premise. Anchoring heuristics describes the common human predisposition to rely too heavily on the first piece of information available (the "anchor") while performing decisions (Kahneman et al., 1982).

All these heuristics are commonly used while any risk management process is occurring, as the decisions made by a manager are fruit of clusters of information processed and by probability judgments under uncertainty. However, heuristic processes are extremely useful but they may sometimes drive to systematic errors or biases, as each of these mental processes may not regard several factors that are not present in the decision process that, yet, should affect judgment of probability (Kahneman et al., 1982), as illustrated on Figure 2.2.

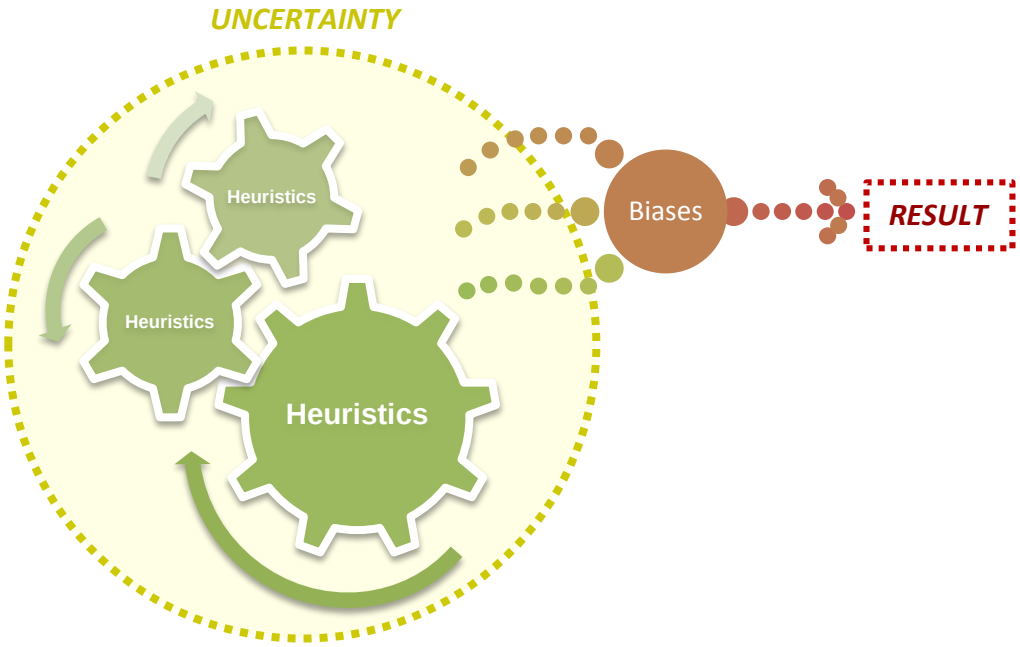


Figure 2.2 Process of generation of biased results

Moreover, these heuristics are particularly important to this work's agenda, for they are a straight illustration of the mental tools engaged in the decision-making processes often carried out by managers and entrepreneurs along their ventures. With such tools decisions are taken and specifically risks are evaluated. This process can add biases and consequently severe errors can be brought in managerial decisions, in case that risk management procedures or systematic protocols are not followed.

This work aims to bring insights concerning the support in decision making processes under uncertainty, by addressing two foremost issues: individual's risk behavior and project risk management support tools, as exposed in Figure 2.3, and from which it will be presented a project risk assessment tool where the user is asked to rate the degree of resemblance concerning a specific project, with a designated project's goal. Thus, the representativeness heuristic will be summoned to assess the likelihood that each specific goal resembles the considered project. While considering a specific goal, one can perform a judgment by the ease with which examples of traits from that specific goal are brought to mind, summoning the availability heuristic. And also while thinking about a specific goal, one can grab too much on a specific detail of the goal, making an estimate that will affect the final deliberation, calling thus the anchoring heuristic.

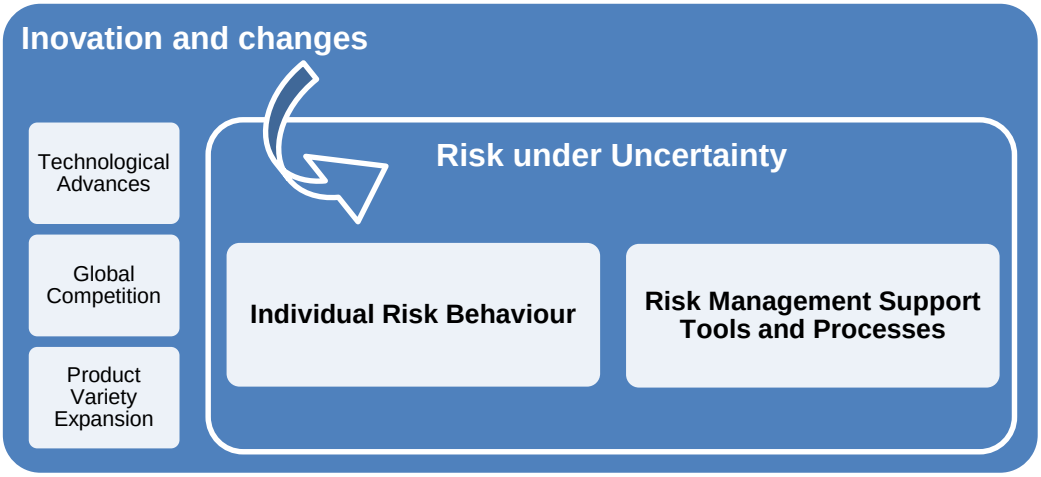


Figure 2.3 Risk under uncertainty framing.

2.2 Individual's Risk Behavior in SMEs

An inherent menacing element is directly connected to the uncertainty intrinsic to a decision making process. Also, projects face internal and external factors and influences that make uncertain whether if objectives are to be successful. The effect this uncertainty has on an organization's objectives is called "risk" (Leitch, 2010), and thus it is considered to be vital to revise individual's risk behavior, as illustrated in Figure 2.4.

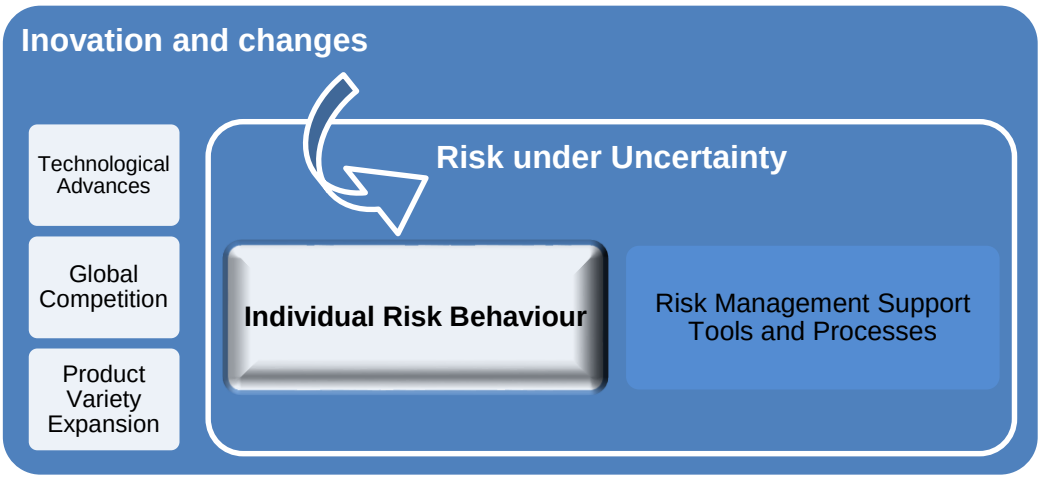


Figure 2.4 Risk under uncertainty framing – individual risk behaviour

According to (PMI, 2013), "Project risk is an uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives such as scope, schedule, cost, and quality, and may have one or more causes and, if it occurs, it may have one or more impacts". On the present essay, only the negative connotation from its definition will be considered and attained, meaning that the corresponding risk management process will be embraced in order to

decrease the possibility that an undesired outcome disrupts a specific project, i.e. the endeavor performed to support the nonexistence of an unwanted consequence onto the project.

SMEs are usually characterized by the central role of their owners and corresponding leading control of a company's and project's vital decisions, high multiplicity on ones' duties and close employee identification (McKiernan & Morris, 1994). Often managing directors engage in the overall risk assessment only by themselves and not discussing risk aspects with others, generally due to the lack of acquaintance concerning available methods to identify and assess risks (Henschel, 2008). Consequently, enterprises in their starting phase often underestimate risks, ignoring them or mostly having only one risk strategy for bearing the risks (Henschel, 2008).

Furthermore, SMEs typically do not have the resources to acquire specialists for each enterprise's position nor in administration functions such as risk management (Matthews & Scott, 1995). Also, SMEs usually do not tend to use specific techniques to identify or manage risks, being that related literature is considerably limited and still in an early phase of development (Jayathilake, 2012). Moreover, due to limitations regarding infrastructure, management, technical expertise, intellectual and financial resources, SME's generally rely on managers to account for major decisions and responsibilities, being far from adopting a proactive approach towards risk (Janney & Dess, 2006).

It is wide known that micro, small and medium-sized firms are generally companies with fewer than two hundred and fifty employees, with a turnover of up to fifty million euros and balance sheet total less than forty-three million euros. It is also known that these companies are commonly administrated by managers with an entrepreneurial character, with a natural tendency to start ventures (Cordeiro & Vieira, 2012).

Thousands of entrepreneurial individuals start ventures every year, and as a result many of them become dissatisfied with their venture's economic performance and thus over half of all ventures fail within five years (Cooper, Woo, & Dunkelberg, 1988). Consequently, researchers have unceasingly been trying to explain over the last few decades why individuals decide to start companies, despite its riskiness. In efforts to answer this question, scholars investigated if entrepreneurs had any particular risk attitude and tested the hypotheses of the risk propensity of entrepreneurs being greater than other managers (Boyd & Vozikis, 1994; Busenitz & Barney, 1997; Krueger & Brazeal, 1994; Krueger, 1993; M. Simon et al., 1999). Since risk and uncertainty are pervasive in management and decision-making (Falk, 2005), understanding individual behavior under uncertainty and risk is noteworthy to the course of this study.

2.2.1 Risk Attitude

There is an obstinate and persistent credence that risk taking is a constant personality attribute, frequently referred to as risk attitude (Weber, 2001). This credence implies that a specific individual takes similar risks across different kinds of situations and that some are generally more risk-averse (or more risk-seeking) across situations than others. However, the framework so

called risk attitude, varies significantly across circumstances as a function of decision content and outcome framing (Weber, 2001). A different conceptualization of risk taking was verified by Elke U. Weber, in which the model of risk taking is a function of two variables (Figure 2.5), being:

(I) Decision makers' perception of the riskiness and return of different courses of action, i.e. risk perception;
(II) Their attitude towards perceived risk, i.e. risk propensity.

Figure 2.5 Variables linked to risk attitude

However, several documents regarding this framework were shown by Weber (Betz & Weber, 2002; Weber, 2001; Weber & Hsee, 1998; Weber, 2010), arguing that differences in risk taking tend to be the consequence of an individual's perception of the riskiness in different situations, rather than an individual's willingness to take on perceived risks. Individual differences on the willingness to take perceived risks were found, but its numbers were substantially less significant and less systematic than individual and group differences in risk perception (Weber, 2001). In other words, systematic individual, group, and cultural differences in the perception of the riskiness and return of choice alternatives were found, while attitude towards perceived-risk has shown a considerable cross-group and cross-situational consistency (Betz & Weber, 2002), as illustrated on Figure 2.6.

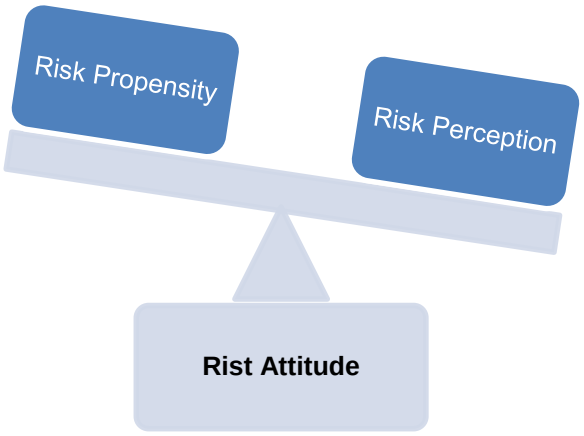


Figure 2.6 Weight of risk perception within an individual's risk attitude

Therefore, since it is risk perception that mainly influences risk-taking, it is essential to understand what leads to variations in risk perception. Empirical evidences are clear regarding these variations across different cultures and countries, as it is easy to notice differences in certain behaviors and styles of customary characters, driven by huge disparities among different traditions and sorts of education (Ding, 2010; Falk, 2005; Weber & Hsee, 1998). For example the study engaged by Weber and Hsee reported consistent and reliable cross-cultural differences in risk preference between results from students from China and students from United States, where they found that Chinese students were significantly less risk averse than Americans in their choices between risky options and outcomes that involved both gains and losses (Weber & Hsee, 1998).

However, further to the evidences concerning group and cultural differences regarding risk perception, many studies state that a greater predisposition to engage and trust in heuristics and consequent cognitive biases may lower the risk perception and modify an individual's decision process (Busenitz & Barney, 1997; Cooper et al., 1988; Krueger, 1993; Simon et al., 1999). And although biases may help individuals cope with their cognitive limitations, they may result in a less rational and less comprehensive decision-making, generally when performing complex and uncertain decisions, which may be particularly prevalent amongst entrepreneurs (Kahneman & Tversky, 1972; Simon et al., 1999; Tversky & Kahneman, 1974).

2.2.2 Risk Perception Among Entrepreneurs in SMEs

Entrepreneurs have been labeled as risk-takers and sharp individualists (Begley & Boyd, 1987; McGrath, MacMillan, & Scheinberg, 1992), contrarily to natural managers from large organizations, who can have entrepreneurial profile but who have generally been described as being risk adverse (Amihud & Lev, 1981). Since the perception of risk is the central variable

concerning this risk attitude, it can be understood that entrepreneurs have a lower perception of the general risk, when compared to other managers (Busenitz & Barney, 1997).

It is agreed that the degree in which the use of heuristics is performed, along with further biases, may significantly explain the variations in strategic decision-making and thus that entrepreneurs use biases and heuristics more extensively in their strategic decision-making than what other managers do (Busenitz & Barney, 1997; Haley & Stumpf, 1989).

This entrepreneurs' use of heuristics and added biases, result thus on the decreasing of their perception of the risk (Busenitz & Barney, 1997). Which is understandable, as the level of uncertainty that entrepreneurs face in decision making is greater than the level of uncertainty which other managers generally do. Managers from larger organizations commonly possess performance and historical documents that reduce uncertainty, or hold resources which provide the possibility to access external tools that reduce uncertainty as well (Busenitz & Barney, 1997; Covin & Slevin, 1989; Hambrick & Crozier, 1985)

A vast use of biases and heuristics enables a perceived sense of overall understanding and a consciousness that the course of events is generally understood (Busenitz & Barney, 1997). Thus, those who are more predisposed to trust heuristics and biases in decision-making are the ones who are most likely to be or to become entrepreneurs in SMEs, which usually don't possess standard decision-making policies (Fredrickson & Iaquinto, 1989). The most cautious decision-makers will tend to be attracted to larger organizations where information is generally available and is methodically processed (Busenitz & Barney, 1997). Figure 2.7 illustrates the belligerent process chain from the representative risk attitude of an entrepreneurial profile.

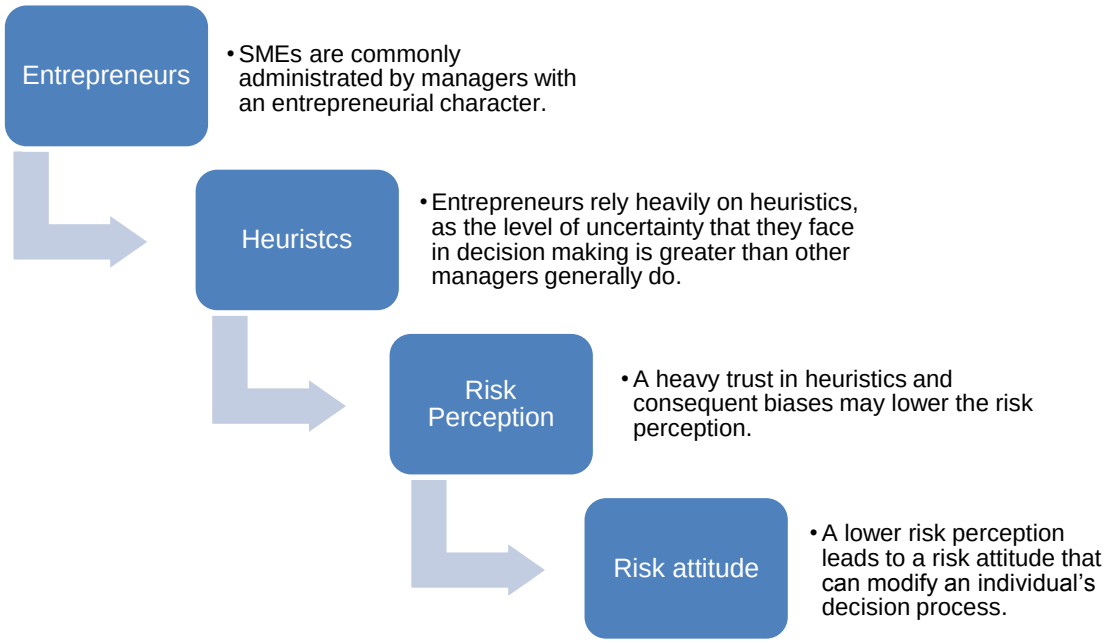


Figure 2.7 Discriminated process of an entrepreneurial risk attitude.

Yet, it is frequently recognized that entrepreneurs and other managers don't differ from one another regarding psychological differences (Brockhaus, 1980, 1982; Busenitz & Barney, 1997; Low & MacMillan, 1988) and that managerial decision-making often deviates from a purely rational model, engaging many times on an non-rational approach (Haley & Stumpf, 1989; Simon, 1955). In addition, entrepreneurship is commonly seen an "enactment" process, where actions precede thoughts, metaphorically speaking, and in which entrepreneurship is more a function of actions taken than some objective set of conditions (Busenitz & Barney, 1997; Gartner, Bird, & Starr, 1992).

Hence, it is imperative to understand the utility of a non-rational approach within the decision-making process. In a scenario where uncertainty and complexity persist, a comprehensive and cautious decision-making process may not be possible to adopt and thus heuristics and biases can rise as an extremely effective and efficient tool to the decision-making process (Haley & Stumpf, 1989; Pitz & Sachs, 1984; Tversky & Kahneman, 1974).

Thus, to study this non-rational approach, an extensive normative model of existing types of biases is available in psychology studies. Some of them are pertinent, such as the *illusion of control*" bias, which occurs when an individual overstates the degree to which his or her ability can increase performance in circumstances where chance plays a big part and ability is not necessarily the determining factor (Langer, 1975; M. Simon et al., 1999). Or *illusion of validity* bias, which is the undeserved self-confidence produced by a fitting between the predicted outcome and the input information (Kahneman et al., 1982). There is the *overconfidence* bias, which refers to the failure to know the limits of one's knowledge regarding different information domains (Russo & Schowmaker, 1992; Simon et al., 1999), or even the *belief in the law of small numbers* bias*,* when an individual uses limited and small sample of information to draw firm conclusions (Einhor & Hogarth, 1981; Kahneman et al., 1982; Tversky & Kahneman, 1974). There is the *Insensitivity to predictability* bias, or the *optimism* bias, along with dozens of other discussed terms (Kahneman et al., 1982; M. Simon et al., 1999).

Nonetheless many biases have been referred and studied and an extensive terminology has been accomplished around these concepts. Compelling a normative terminology complicates the definition of what is a "bias" in probability judgment and such debate is of little practical utility and it focuses the attention only on the conditionality of normative models (Einhor & Hogarth, 1981).

Furthermore, in order to understand the non-rational approach within the decision-making process it is necessary to transcend some of these important findings performed among the psychology field, and address some vital aspects from recent discoveries accomplished in neuroscience studies.

2.2.3 Neuroscience

Since Plato's disclosure of his *Theory of Forms*, along with new notions of epistemology, and until very recently, philosophers and scientists have described the decision-making process as either rational or emotional (Greco, 1993). According to Plato, Descartes and Freud's psychological concepts, we are deliberate and logical creatures and as we make decisions we are supposed to consciously analyze the alternatives and carefully weigh the advantages and disadvantages (Lehrer, 2009). In addition, modern economic theory ignores the role of emotions on decision-making, assuming that it involves a rational Bayesian maximization of expected utility (Bechara & Damasio, 2005).

However, as scientists understand the mind's enigmas with the latest tools of neuroscience, emerges the evidence that comprehensive and rational decision-making strongly depends on a previous accurate emotional processing (Bechara & Damasio, 2005). This stands as a fresh approach towards behavioral economics, as well as innovation, project and risk management literature.

It is now known that the mind is composed by a complex network of different areas, most of which are non-rational and involved with the production of "*emotion"* (Lehrer, 2009). An emotion is the collection of chemical alterations in the body and brain, activated by a dedicated brain system that unconsciously and automatically responds to specific contents of one's perceptions from some specific object or experience, such as actual events or memory evocations (Damásio, 1994, 1999, 2003).

In the course of these objects and experiences, the brain impels internal responses to the rest of the body, such as endocrine release, heart rate changes or smooth muscle contractions (Bechara & Damasio, 2005; Damásio, 1994). Alongside with these responses from the brain to the body, a series of responses are similarly sent from the body to the brain, such as the release from within the central nervous system of neurotransmitters like dopamine, serotonin and others, modifications of the state of somatosensory maps or sensory system, or modifications in the transmission of signals from the body to somatosensory regions. The ensemble of all these enacted responses along the body and brain constitutes an "*emotion*" (Bechara & Damasio, 2005; Damásio, 1999, 2003).

These responses and signals are linked with one of the most important parts of the brain, the ventromedial prefrontal (VM) cortex. The VM cortex lies in the orbitofrontal cortex, which is a prefrontal cortex region from the frontal lobes of the brain, and is responsible for integrating visceral emotions into the decision-making process. The VM cortex is the one instrument that is connected to the limbic system and areas such as the brain stem or the amygdala, and that transforms the induced somatic responses into a rational contrivance, as showing on Figure 2.8. In other words, it connects the feelings generated by the "primitive" brain to the stream of conscious thought (Bechara & Damasio, 2005; Damásio, 1994; Lehrer, 2009).

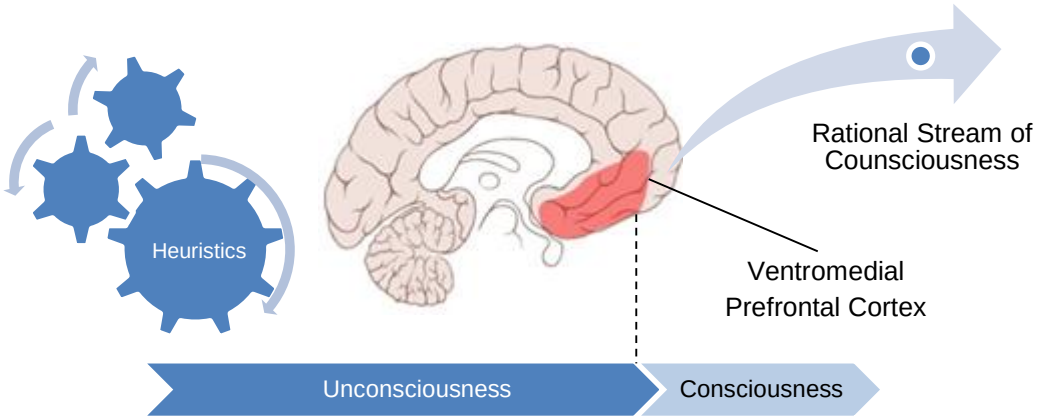


Figure 2.8 Split of unconscious and unconscious stream in the VM cortex.

When an individual is drawn to a specific experience or object that appeals for a decision-making, such as the menu's choice in a restaurant or the task of hiring a new collaborator for a company, the VM cortex converts somatic responses into conscious feed, in order that an option is chosen. Briefly, this analysis takes place outside of conscious awareness, where the alternatives are biased in somatic unconsciousness. And when a glimpse of a delicious food is perceived or an affirmative trait from the job candidate is acknowledged, means that the VM cortex has converted the assessment into a positive emotion (Damásio, 1994, 1999; Lehrer, 2009).

A vital aspect in making decisions is the ability to predict the consequences of an event, which is performed specifically in the VM cortex. While the amygdala is engaged in emotional circumstances that burst a quick response, the VM cortex is engaged in emotional situations driven by thoughts and through reflection (Bechara & Damasio, 2005). Thus VM cortex engages in predicting the emotion of the future, therefore forecasting the consequences of one's own actions (Bechara & Damasio, 2005; Damásio, 1994).

In addition, it is recognized that somatic signals generated in anticipation of future outcomes do not necessarily need to be perceived consciously or rationally (Bechara & Damasio, 2005). There is neurobiological evidence in support of the notion that people often make judgments based on "hunches" or "gut feelings" and subjective evaluation of consequences. For example, Wall Street strategists always attempt to predict where the market is headed based on their "hunches" and "gut feelings", a behavior labeled "the prediction addiction", and often a better predictor than the market data and fact sheets (Zweig, 2002). When information is too complex and patterns are not clear, our rational cognition may struggle to figure which strategy is best, while our somatic signals are what implicitly or explicitly bias us towards the advantageous strategy, under the form of these "hunches" and "gut feelings" (Bechara & Damasio, 2005).

Consequently, decision-making is a process guided by emotions and thus conscious knowledge alone is not enough for making advantageous decisions (Bechara & Damasio, 2005; Damásio, 1994, 1999, 2003). The support for this notion comes from several studies performed by António Damásio, Antoine Bechara, Daniel Tranel, Hanna Damásio, Robert D. Rogers and many others (A. Bechara & Damasio, 2005; Damásio, 1994; Rogers et al., 1999). Among these studies were analyzed patients with diminished decision-making capabilities, subsequent of specific brain injuries, who presented abnormal activation of emotional signals that biased advantageous decisions (Bechara & Damasio, 2005). These patients, despite preserving their intelligence and being apparently normal, had attained injuries where the neural connection with the VM cortex was severed. Thus they were unable to comprehend their own emotions and lost access to the wealth of opinions that they would normally rely on, leading to a disastrous and tragic cascade of decisions in their lives that ultimately conducted to their loss of independence (Damásio, 1994).

One of the examples of this evidence comes from a famous study where António Damásio and his colleagues added a physiological measure to a gambling game, played by both normal people and patients who had injuries in the VM cortex. The goal was to assess somatic state activation, with neurological detection technology, while subjects were performing decisions during the gambling task (Damásio, 1994).

On the gambling game conducted by Damásio, subjects had to choose between four decks of cards available (A, B, C and D) and to take one card at a time. Each card chosen implied a reward or loss of a certain amount of real money. Two of these decks (A and B) yielded a high immediate gain but a larger future loss, causing a long term loss, while the other two decks (C and D) yielded lower immediate gain but a smaller future loss, generating a long term gain. The goal of the task was to maximize the profit in a series of 100 card choices, without the subject's acknowledgement of the number of choices or the content of any deck. Each deck is pre-programmed with various schedules of immediate reward and future punishment and the order of the cards is different according to the nature of each deck.

After a number of plays, normal subjects ended up avoiding disadvantageous decks (A and B) and preferred the good decks (C and D). By contrast, VM patients did not avoid the bad decks (A and B), and even preferred them, expressing their real-life inability to decide advantageously (Bechara, Tranel & Damasio, 2000; Bechara & Damasio, 2005; Damásio, 1994). These results suggest that the lack of ability to generate emotional signals misleads the VM cortex to notify the individual of how painful it should feel if a decision led to money loss, driving VM patients to fail avoiding the decks that lead to painful losses until they go broke, in a manner that is very similar to how they behave in real life (Bechara & Damasio, 2005).

A curious finding during the gambling task took place on the fact that Damásio's neurological tools detected, in common and healthy individuals, strong somatic signals that happened together with their selection of the safer decks. However these signals weren't consciously perceived by subjects, as they didn't have enough data to draw any conclusion or hint and moreover persisted

to choose risky decks. However somatic signals detected by neurological tools anticipated in fact future positive outcomes (Bechara & Damasio, 2005).

Hence, conscious knowledge alone is not sufficient for making advantageous decisions and it is recognized that somatic signals and biases that were not perceived consciously, anticipated future decisions (Bechara & Damasio, 2005). Consequently, this methodology developed by Damásio may provide a model to measure the degree with which one is apt and even predisposed to access and rely on their heuristic mechanisms, as well as consequent biases, and as a result to quantify an individual's perception of risks. Therefore, in this study, the hypothesis of whether if Damásio's Gambling Task can be applied as a model to measure individual's risk perception will be formulated and further investigated:

This premise attempts to link risk behavior studies, and thus risk management related studies, with neuroscience findings, which have recently proved to be valuable endeavors concerning several economic problems. Further on this study, this hypotheses and conceptual model will be presented as a methodology and will be applied in a case study, lying as the first interrogation from this work's agenda.

2.3 Innovation and Risk Management in SMEs

In addition to the study of decision-making processes and individual's risk behavior, it is vital to study models and techniques to assist and support the process of choosing the best decision to make under an uncertainty environment. This uncertainty is nowadays more protuberant due to the on-going technological advances that started to take place over the last decades, which proved that the world is quickly heading to a global knowledge-based economy (Yun-hong, Wen-bo, & Xiu-ling, 2007). Such changes and advances dragged all kinds of enterprises to held on an exceedingly competitive, challenging and uncertain environment in order to endure and subsist (Emmenegger & Laurenzi, 2012).

In order to overcome the swift technological advances, global competition, product variety expansion and to predict and positively respond to changes, the development of an integrated capability to innovate has become the prime strategy for most of SMEs (Ebrahim, Ahmed, & Taha, 2010). Also, it is known to be considered as a decision factor of a project's success or failure, the use of formal and systematic processes (Griffin, 1997),

Thus, the uncertainty associated with innovative processes is bonded to an inherent risk of failure (Vargas-hernández & García-santillán, 2011). This inherent risk brought to this study the necessity of studying individual risk behaviour, as well as it now brings the need to study and evaluate the use of risk management tools and processes to support decision-making (Figure2.9).

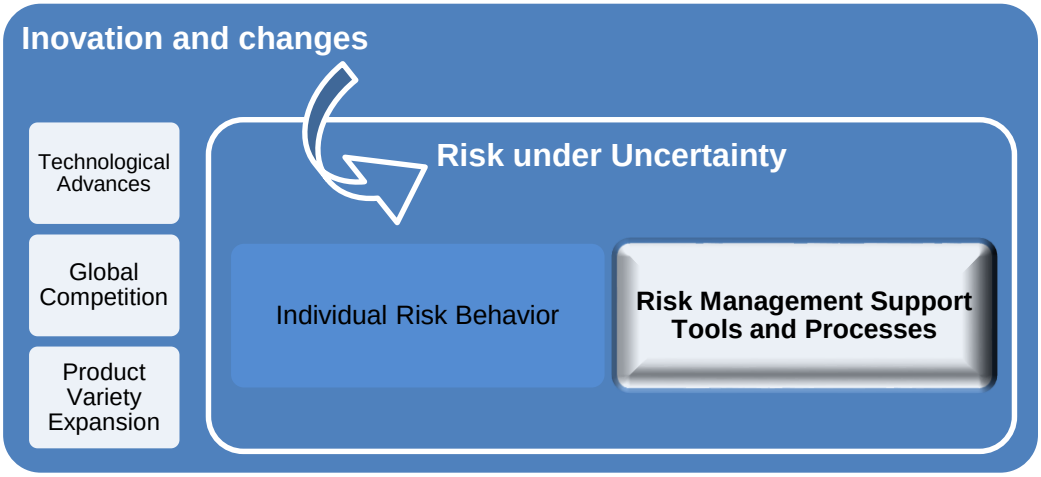


Figure 2.9 Risk under uncertainty framing – risk management support tools and processes

If risk is inherent to uncertainty and subsequently uncertainty is bonded to innovation, a legitimate question is reasonable to be inquired: *why innovate*? There are numerous approaches towards the concept of innovation. As refer by Black (2003), innovation is the action or process of creating a new method or idea, or, according to the Oxford Dictionary of Economics, the application of a new idea, involving a new/modified product, or new/modified way of making a product (Black, 1997).

Innovation can be stated as the core capability to master and maintain holistic value, generating new dynamics in which opportunities of change are exploited and new ideas emerge (Jin et al., 2004). According to Afuah (2003), innovation is the employing of new knowledge to provide a new product or service that the customers want. (Ven, 1986) describes innovation in terms of a new idea, which may be a combination of older ideas, of a plan that challenges the present order, of an institutional context, or a method which involves people and is perceived as new by involved individuals.

Thus, many definitions were rendered to tally the concept of innovation and a common ground among each definition sees innovation as the action or process of creating a new method or idea, as well as its exploration and commercialization (Massa & Testa, 2008). Innovation is ultimately the reach of something different. It's creating something new through processes of learning or knowledge (Smith, 2005).

The importance of innovation for the subsistence and competitiveness of organizations is an irrefutable fact (Cordeiro & Vieira, 2012; Ebrahim et al., 2010; Muršič, 2011; Vos et al., 1998; Zhu, Wittmann, & Peng, 2011). The eruption of information sharing, the incremental growth of a globalized economy and the expanding crisis have transformed the rules, pushing innovation as a fundamental device on the pursuit of profitable and sustainable growth (Cordeiro & Vieira, 2012).

SMEs are generally characterized by their capability to quickly respond to changes and to innovate, which represents a vibrant competitive advantage. They are also categorized with a growing participation regarding employability, economic dynamics and output development (Carayannis, Popescu, Sipp, & Stewart, 2006). SMEs have a fundamental role in society from an socioeconomic point of view, comprising 99.8% of the total number of companies in Europe, employing 67.4% of all workers and generating 58.1% of the European gross value added (Verbano & Venturini, 2013).

However, new products are inherently risky endeavors and an extensive quantity of projects engaged in SMEs fail, leading to the closure of more businesses than to its expansion (Keizer & Vos, 2003; Muršič, 2011).

Unfortunately SMEs face critical challenges regarding their sustainability, specifically they struggle with a lack of standard practices regarding their management procedures (Cordeiro & Vieira, 2012). In addition, SMEs face severe problems in acquiring the right knowledge and skills. SMEs regard knowledge sources as widely distributed, poorly sign-posted, and difficult to find, thus being dependent on their closer agents, such as suppliers, competitors or customers. As a result, most SMEs struggle for the acquisition of new knowledge and skills, specifically knowledge and skills to successfully launch their products, to solve technological difficulties regarding product specification and production technology, as well as knowledge and skills to solve managerial problems (Vos et al., 1998).

In addition, in order to maintain an innovative competitiveness, companies' organizational structure must be aligned with environmental contingencies, strategy, and technology (Yu-Yuan Hung, Chung, & Ya-Hui Lien, 2007). But primarily, it´s particularly necessary to integrate the company´s capabilities in the execution and management of the new product development process, in order to innovate (Aleixo & Tenera, 2009).

2.3.1. New Product Development and Project Risk Management

New product development (NPD) process is a conceptual and an operational model structured to appropriately lead new products from its conception to commercialization, enabling an effective estimation of schedules, costs and required activities (Cooper, 1990). There are several models regarding NPD approaches engaged by practitioners and investigators, in which their differences lay on the level of detail required for an efficient characterization of the development of a new product (Cooper, 1990; Kagioglou et al., 1998; O'Connor & Ayers, 2005).

While structuring a NPD process, it's necessary to consider particular aspects of a company, such as its innovation perspective, its characteristics of risk, budgeting, but most importantly the skills of the engaged personal (Aleixo & Tenera, 2009).

The personal engaged in the NPD team, as well as their motivation and collaborative efforts, directly depend on several aspects, both individual and collective. One of the most important

aspects is their level of trust. The higher the level of trust, more eager the collaborators are to share information, voicing new ideas or ask for assistance (Jassawalla & Sashittal, 1998).

However, manager´s initiatives and directives towards collaboration also play a major role. A highly competitive and competent team must attain managers and functional participants to elevate integrative process into collaborative process (Aleixo & Tenera, 2009). Summed up, several aspects collected from literature research are presented as following:

- Managers must be interested and curious and spend more meaningful time with the team and with potential customers. Managers who are deeply committed to growth devote 20% to 40% of their time to these activities. This approach is crucial to getting senior operating executives to devote more time to the future. If an executive isn't willing to focus on emerging customers' needs and support the start-up team, the staff executive should channel the resources elsewhere (Laurie & Harreld, 2013);
- While assembling the team, efforts must be done according to capabilities, not available people, and staff up only when the strategy, business model, and value proposition are clear. Scaling the business prematurely wastes money; (Laurie & Harreld, 2013)
- Teams should be formed by representative members of each multiple organizational functions, to integrate their expertise and decentralize the decision-making authority (Ayers, Dahlstrom, & Skinner, 1997; Denison, Hart, & Kahn, 1996);
- All tasks, including product concept, feasibility, development, validation and commercialization are held by the new product development team (Dong & Yan, 2006);
- Team should attain individual skills such as knowledge, commitment to the project, cooperation and the support of senior management (Barczak & Wilemon, 2003);
- Members, who have strong work ethic, are disciplined, determined, resourceful, and motivated, and who are cooperative, are considered effective team members (Barczak & Wilemon, 2003).

Moreover, it is recognized that within this nature of innovative processes, there is always a existing bond to an inherent risk of success, which subsequently brings on the necessity of a proper risk management in innovative processes (Vargas-hernández & García-santillán, 2011). Thereby, and since the purpose of an integrated risk management process is to facilitate innovation rather than stifle it, innovating firms require a strategy not of risk avoidance, but of early risk diagnosis and management (Keizer et al., 2002; Pereira, Tenera, Bispo & Wemans, 2013). Literature review however shows that, despite operating in the same demanding environment as large enterprises, SMEs tend to disregard the importance in managing risks, contrarily to their larger counterparts who invest time and resources in order to engage in suitable risk management practices (Brancia, 2011; Jayathilake, 2012; Smit & Watkins, 2012).

It is known that, associated with the strategy of innovation stands an inherent risk factor, generated by the uncertain nature of innovative elements, consequently driving innovative projects to require early risk identification and management (Vargas-hernández & García-

santillán, 2011). Project risks have its origins in the uncertainty events existing in every project and these risks can be: actively acknowledged, being risks that have been identified and analyzed and making it possible to perform plan responses; they can be acknowledged risks that cannot be managed proactively, and should be assigned as a contingency reserve; and they can also be unknown risks that cannot be managed proactively and therefore may be assigned a management reserve (PMI, 2013).

In addition research has found that companies who develop and launch new products are considered inherently risky endeavors and that about 40% of such projects fail, being that only 14% of new product ideas are commercially successful (Keizer & Vos, 2003). Hence, the risk management procedures will encourage manufacturers, managers and researchers to examine ways to optimize the process of developing innovations across the spectrum of risk (Song, Neeley, & Zhao, 1996). Like any management approach, risk management is generally performed throughout a sequence of steps and ought to be addressed proactively and consistently throughout a project. Hence, several risk management perspectives are consistent and taken into execution onto a project's development, such as Project Management Institute (PMI), synthesizing risk management processes in their Project Management Body of Knowledge (PMBOK®), conferring a list of procedures to conduct risk management activities according to the Figure 2.10 (PMI, 2013).

Figure 2.10 Risk management procedural activities according to PMBoK

Other approaches are available such as the one performed by the Association for Project Management (APM), providing a practical framework with the Project Risk Analysis and Management (PRAM). It addresses how the project risk management processes are connected to corporate level risk management, basing its structure on the premise that risk exists as a consequence of uncertainty. It is divided in the following stages and sub-stages demonstrated on Figure 2.11 (Norris, Perry & Simon, 1992).

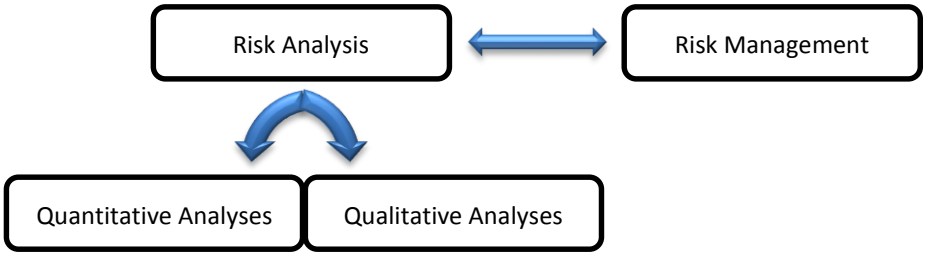


Figure 2.11 Project risk analysis according to PRAM.

Nonetheless, risk management processes may differ according to different areas of application, altering general or specific procedures and maintaining its consistency (PMBOK® Guide 5th Edition, 2013). For example Chapman's work provides a review over the project risk management process developed by a working party of the APM, in which are delivered a number of new insights. This is accomplished by establishing 9 phases over the process and including: a detailed phase structure based on objectives, tasks and deliverables; a formal process of defining the project to be assessed; conducting the risk management process as a project in its own right; and conducting the resolution of ownership-contractual issues as a project in its own right (Chapman, 1997).

Similarly, Preston G. Smith followed the PMBOK's guidelines and suggested an analogous model of risk management that reveals its critical characteristics, thus enabling proactive risk management within a five-step process: identify risks; analyze risks; prioritize and map risks; resolve risks and monitor risks (Smith, 2002).

Hereafter, with appraisal of the stated literature, it is patent that there is an agreement regarding the adopted processes to assess and manage project risks, regarding its fundamental basis. The existing differences among them lay upon variations in the level of detail and on the diverse ways of assigning activities within the correspondent processes stages, giving that they are merely the formalization of the common sense that project managers have applied for centuries (Chapman, 1997).

Whereas, the methodologies and techniques adopted to identify and assess project risks, acknowledging and accepting their structural and procedural differences, are unquestionably what will define the success or failure of risk management (Chapman, 1997; Keizer & Vos, 2003; Smith, 2002). Hence, a research group from Eindhoven University has developed a technique to

identify, evaluate and manage risks over innovative projects, called Risk Diagnosing Methodology (RDM) (Keizer et al., 2002).

2.3.2 Risk Management Methodologies

Apart to the inherent intuition from firm's owners or managers, the induced risk assessment models, when used, are frequently based on general project management practices, such as the Balanced Scorecard (BSC), or specific approaches such as FMEA, FTA or sometimes AHP.

BSC instrument facilitates the monitoring of the firm's success factors, which can be sighted as opportunities as well as risks, meaning that the BSC is by nature an instrument close to the risk's grounds function (Henschel, 2008). The concept of BSC is based on 4 perspectives: financial perspective; customer perspective; internal perspective; and innovation and learning (Wang, Lin, & Huang, 2010), where each of the 4 perspectives is extended by risk events, corresponding risks with influencing variables assigned to selected goals in the four perspectives, all put together with a description of the measurement of risks and measures to control them. As soon as critical target values are reached, a report is generated and the process of preparation and maintaining of a risk-adjusted BSC is primarily handled by the controlling function (Henschel, 2008). This represents a practical approach and it can be established without any great effort if a BSC has already been implemented.

Another risk management approach is Failure Mode Effects Analysis (FMEA), which is a systemic approach that helps to identify and reduce feeble aspects in an early stage of conception of products and processes (Blesa, Medrano, Plaza, & Ubé, 2003). Three measures are considered: the probability of failure occurrence, the impact or severity of the failure, and the capacity to detect failure before it occurs (Bahrami, Hadizadeh, & Sajjadi, 2012). The multiplication of these measures generates the RPN (Risk Priority Number) (Bahrami et al., 2012).

FMEA can be defined as a group of controlled activities that are employed in the following purposes: (Bahrami et al., 2012).

- Identification and assessment of possible faults in a product or process as well as outcome results from these faults.
- Determination of activities which can decrease or eradicate the probability of occurrence of possible faults.

Also, Fault Tree Analysis (FTA) can be used as a risk identification method or as a risk analysis instrument. FTA reckons the core reasons for an occurrence and, as these rational reasons are identified, the upper occurrence is in fact converted into a consequence of the lower occurrences. In project risk management this method has often the advantage of drawing the project's bounds of stakeholder organization's risk management solutions (Edwards & Bowen, 2005). With this method, the probability of negative events can be estimated and its causes deducted, based on the constructed Fault Tree. Furthermore the probabilities of emergency situations are assessed,

as well as response actions, and thus conventional decision-making procedures can be applied to determine the numerical representation of each action (Liu, Fan, Yuan, & Li, 2014). The following image represents an example of FTA

Another risk assessment methodology is Analytic Hierarchy Process (AHP). AHP is a multivariate analysis technique that aims to decrease the randomness of subjective assessments, having in consideration different objectives grounded on different criteria (Goodwin & Wright, 2007). With AHP it is possible to break down a decision problem into a sequence of decision elements that can be weighted and compared, in order to define priorities (Zahedi, 1986). In the end, performing sensitivity and qualitative analysis will yield in results that can support a broad range of decisions such as risks and opportunities modelling, forecasting, strategy and product design, technology selection, and so on (Gaudenzi & Borghesi, 2004; Partovi, Burton, & Banerjee, 1990).

An alternative to assess and manage project risks in via risk lists, risk-action lists, risk strategy models and risk strategy analysis, in which the simplest approach is by the use of risk checklist forms (Costa, Barros, & Travassos, 2007; Li, 2013). The checklist risk questionnaire may contain an assemblage of general risk items that support a quick identification and analysis of possible sources of risk, or simply facilitates the development of an awareness of the specific risks associated with a project (Li, 2013). Several practitioners attest that, further to the support provided on identifying project's risks, risk checklists can influence risk perception and decision-making processes among their projects (Keil, Li, Mathiassen, & Zheng, 2008; Li, 2013; Schmidt, Lyytinen, Keil, & Cule, 2001).

Nevertheless, SMEs generally do not lean towards the use specific techniques to identify or manage risks and literature related is limited and still in an early phase of development (Jayathilake, 2012). Moreover, due to limitations regarding infrastructure, management, technical expertise, intellectual and financial resources, SME's are far from adopting a positive approach towards risk (Janney & Dess, 2006).

2.3.3 Risk Diagnosing Methodology (RDM)

The purpose of RDM is to provide strategies that will improve the chance of a project's success by identifying and managing its potential risks. This methodology allows a firm to diagnose thoroughly and systematically the technological, organizational and business risks a project faces, and to formulate and implement suitable risk management strategies (Keizer et al., 2002).

The accomplishment of product innovation is determined by external influences and internal conditions in which all these aspects relate, instead of focusing in a smaller object. In order to be effective, a risk assessment method needs to help identify potential risks in the following domains exposed on Table 2.1 (Keizer et al., 2002).

Table 2.1 Domains held in risk identification through RDM.

Technology	Market	Finance	Operations
Product design and platform development, manufacturing technology and intellectual property.	*Consumer and trade acceptance, public acceptance and the potential actions of competitors.*	*Commercial viability*	*Internal organization, project team, co-development with external parties and distribution and supply.*

According to RDM, the risk management procedure involves 9 steps whereby the people involved are being interviewed individually and systematically by a risk facilitator. This risk facilitator is not a member of the project team and during the interview addresses the perceived risks for the project. Risks are identified subjectively and analyzed regarding views on knowledge gaps in the project, throughout the development and assessment of a risk questionnaire. The true nature of project risk is determined not only by its likelihood and its effects, but also by a firm's ability to influence the risk factors (Keizer et al., 2002).

In order to manage the project portfolio better, it is introduced the "Innovation Funnel", on Figure 2.12, an approach created in the early nineties based on the model of Wheelwright and Clark, with six stages in which projects are defined, monitored and assessed according to a predetermined set of decision criteria (Vos, Keizer, & Halman, 1998).

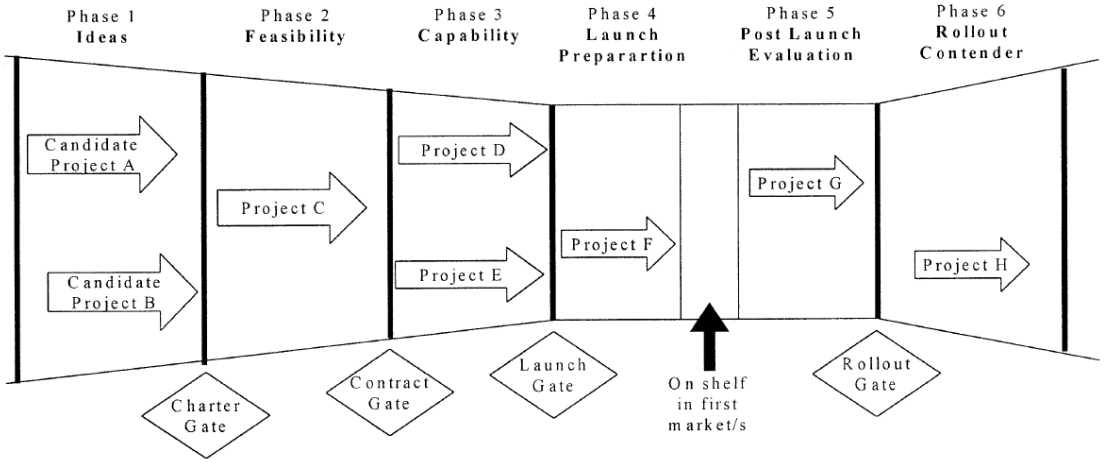


Figure 2.12 Model of Wheelwright and Clark "Innovation Funnel" (Keizer et al., 2002).

This methodology achieves its most relevance upon the end of the feasibility phase of the innovation process, when the transition to the actual product development takes place. At this phase of the project, management still has the ability to substantially influence the course of events and make a considerable impact on the eventual outcome. However, a periodical reassessment of impending risks in subsequent phases is still recommended (Keizer et al., 2002). RDM is intended to be executed at the end of the feasibility phase, and it's committed to consider issues such as consumer and trade acceptance, commercial viability, competitive responses,

external influential responses, human resource consequences, and manufacturability, throughout three different phases and 9 different steps, illustrated as it follows on Figure 2.13 (Keizer & Vos, 2003).

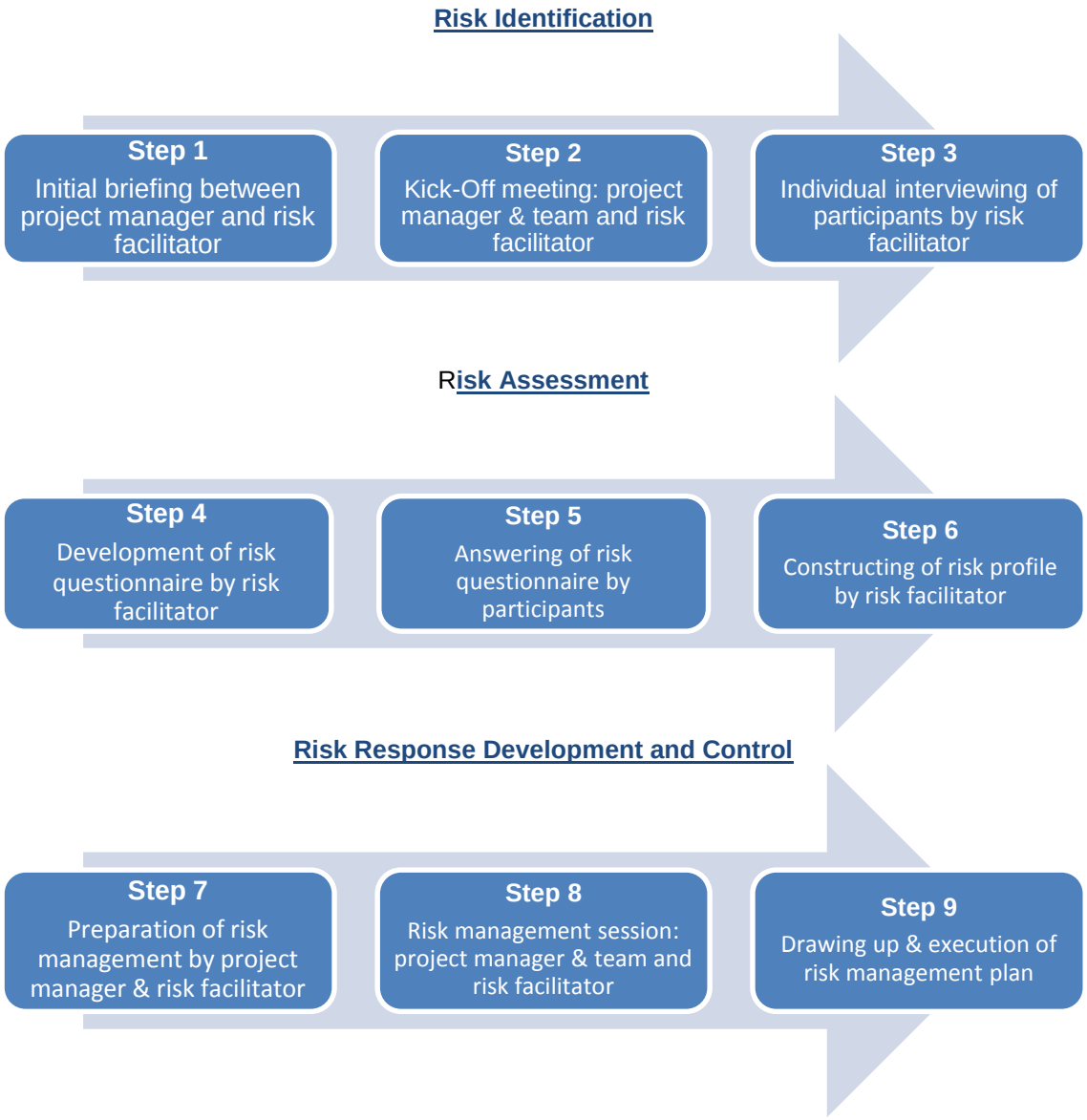


Figure 2.13 Different stages and steps from RDM's standardized process

In the beginning of the risk management session there is an exchange of different information between the project manager, team and risk facilitator, who may be either a trained internal person, or an external consultant with state-of-the-art knowledge of product innovation. Then the risk facilitator develops a risk questionnaire, with the information provided in the first phase, which is then responded by participants and subsequently is engendered a project risk profile. While answering the developed risk questionnaire, respondents are asked individually to score the risk statements developed, on three five-point scales regarding the following parameters displayed on Figure 2.14 (Keizer et al., 2002).

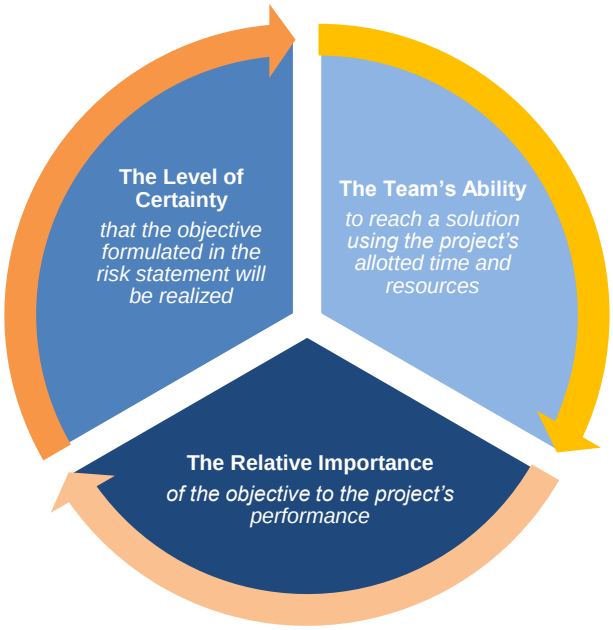


Figure 2.14 RDM's risk parameters

After the respondents have completed the risk questionnaire, the risk facilitator constructs a risk profile with their scores. The risk profile presents both the degrees of risk perceived by the majority of the respondents and the distribution of their perceptions. When the average of the scores support of a minimum of 50% among the answers, it will provide the facilitator an initial view of the thinking of the majority of the respondents, being able to classify each risk statement along the three parameters into four groups by the following decision rules described on Table 2.2 (Keizer et al., 2002):

Table 2.2 Existing risk statements and specifications according to RDM

Statement's Score	Specifications and Requirements for Each Score
"*"	*At least 50% of the scores are 1 or 2 on the 5-point scale (1 being "very risky"), and there are no scores of 5 on the 5-point scale.*
"0"	*At least 50% of the scores are 4 or 5 on the 5-point scale, and there are no scores of 1 on the 5-point scale.*
"m"	*At least 50% of the scores are 3 on the 5-point scale, and there are no scores of 1 or 5 on the 5-point scale.*
"?"	*For all remaining cases. There exists a lack of consensus, visible in a wide distribution of opinions. After discussion with the interviewees, the "?" scores may be changed to one of the other three.*

Next, the risk facilitator classifies each risk statement into a "risk class" by examining the questionnaire responses. RDM uses five risk classes: "S", for safety; "L", for low risk; "M" for

medium risk; “H” for high risk and “F” for fatal. For example, a combination of scores “*,*,*” on a given risk statement would result in its classification of “F”, as so risky that It would be fatal for the project if anything is made to safeguard it, while the combination “0,0,0” would result in a classification of “S”. There are a total number of possible risk scores of 64 combinations, presented on Appendix 1. If there is a distribution of opinions, the risk score is represented by a range between the lowest and highest risk class rated, leading then to a discussion and clarification in order to find a general consensus (Keizer et al., 2002).

Finally, RDM’s last phase risk response development and control include the development of creative and effective action plans to deal with the risks identified during the risk assessment. Eventually a management session is conducted, where project planning and problem solutions are evaluated against the risks that have been identified (Keizer & Vos, 2003). Hence, RDM conducted for a specific project generates proactive, cross-functional solutions to manage project’s risks effectively and proactively. A company might also use RDM outcomes to search for structural weaknesses in their innovation process, a process which fits naturally and adaptively among enterprises, yielding the necessary data to accelerate learning, to increase a company’s innovation capabilities and thus its innovation success (Keizer et al., 2002).

In addition strong aspects take part of RDM such as: the risk identification is done on individual interviews, avoiding a potential influence from possible group opinion leaders, creating a dynamic where each team member is vital for the assessment; the fact that risk facilitator is external from the project team ensures objectivity and aids the lack of experience and skills in SMEs; and finally the most comprehensive checklist available in literature is a definite plus of this tool. The weakness of RDM is the complexity and time consumption, though it can be adapted to smaller projects (Muršič, 2011).

2.3.4 Tools and Applications

SMEs are commonly averse to engage in endeavors to develop software tools that will accurately adjust their necessities, and hence the choice of acquiring a standard and available product is typically the preferred, and perhaps the best, solution (Leopoulos, Kirytopoulos, & Malandrakis, 2006).

In the work developed by Leopoulos et al. is presented a scrupulous review of the basic risk management tools, along with their key features, available to companies at that time (Leopoulos et al., 2006). They were able to collect a list of 10 tools strictly dedicated to project risk analysis and bring together a list of specifications that each tool was able to provide, with the corresponding rating. The data gathered by Leopoulos et al. provides the information that the range of capabilities is generally reflected in the price of the tool. However these findings date back at 2006, therefore the presented tools were re-examined and explored along the course of this essay and prompt inferences were rendered that whether their access was problematical and dense or the tools seized to exist. The remaining seven tools were also considered and taken

under examination and thus a general overview can be brought to attention that the tools either are no longer available or the efforts to gain access to them are laborious and time-consuming, being required a direct communication with the tool's administrators. In addition, tools from the list which are indeed currently available entail expenses in order to be used, going against the predisposition of SMEs and start-up enterprises, where it is acknowledged the existence of a lack of resources to devote among activities such as risk management (Kirytopoulos, Leopoulos, & Malandrakis, n.d.). Hence, a new search of models and tools presently available was performed, in order to update the reference list previously found by Leopoulos et al. This search was fulfilled throughout academic databases, comparative bibliography and it was carried out exclusively via online, since the internet stands as the baseline for the majority of undertakings accomplished by innovative small and medium businesses (Consoli, 2012). The results of this search can be found on Table 2.3.

Table 2.3 Comparative analysis of available models and tools dedicated to project management processes.

Name/Year	Functionalities	Advantages	Disadvantages
Iris Intelligence 2005	Organizational integrated risk management within wide business practices.	• Integration with Microsoft Office; • User-Friendly; • Cloud based possibility; • Complete.	• Very Expensive; • Designed to manage only organizational risks.
RiskCloud 2003	Risk identification and assessment with personal support.	• Cloud based (no installation required); • Visual & User-friendly; • AS/NZS/ISO31000:2009; • Complete.	• Expensive; • Difficult access; • Organization analysis and not specific project analysis.
ProjectFuture 2003	Project's quantitative and qualitative risk calculation and identification software.	• List of possible risks, effects, causes and responses; • Risks associated with tasks; • Possibility to evaluate severity of risks associated with different dates.	• Limited number of Projects; • Expensive; • Software installation required.
RiskyProject 2002	Project planning, scheduling, quantitative risk analysis, and performance measurement.	• Add-In association with Microsoft Project; • Possibility to regulate the risk tolerance.	• Complex; • No risk identification; • Software installation required; • Dilatory and slow processes.
SME-at-Risk 2002	Service that aims to provide a comprehensive understanding of the risk management basics.	• Provides a vast know-how basis; • Shortens the access to existing articles; • Shares information.	• Lack of management; • No functionalities in terms of tool; • Only provides literature review.
Spotrisk 2013	Provides a qualitative perception and early identification of project risks for SMEs.	• Visual and User-Friendly; • Cloud based; • Vast know-how basis; • Free.	• Idiosyncrasy on goal's interpretation; • Incomparability of projects due to biased responses; • Technical and operational faults.

A list of the most relevant tools found is presented on Table 1, which includes a brief description along with the identified advantages and disadvantages of each one of them. All the mentioned tools use a subjective risk approach based on uncertainties and nearly all identifies, prioritizes and address risks. Though, this search brought as a result that certain software tools exceeded the limits of project risk analysis and management, and thus extending its applicability to risk management fields among other organizational and business structures, such as *Iris Intelligence* and *RiskCloud*.

The majority of the tools was not perceived as being suitable *per se* to SME's, because either they are expensive, or complex, or its access is laborious and time-consuming, compelling the company to use extensive efforts and time to an activity which most SME's managers consider not to be a binding activity.

However, it is presented an accessible tool – Spotrisk® (2013) – developed by a Portuguese company – WS Energia - to assess project's risks from among SMEs, start-up enterprises or embryonic businesses, in which the main utility is to support project managers along their decision-making tasks and processes. The disadvantages found concern an idiosyncrasy on interpretation of the questionnaire, as well as an incomparability of projects due to biased responses. Also several technical flaws were identified and modifications aiming to increase the quality of the platform's navigation process are required. This essay proposes the analysis of the presented tool, as well as the research of models and arrangements to deal with these weaknesses, explored on the next chapters.

2.3.5 Spotrisk®

Spotrisk® is a risk management open application, held in a web-based platform, designed to SMEs and Start-up enterprises. With a RDM framework basis, this application proposes to assist managers in performing an early identification, assessment and control of risks inherent to innovative projects, and to validate the working and thinking methods regarding successful products, from concept to global commercialization, in order to foster innovation projects into market.

This application was hypothesized, from the beginning of its conception, aiming to perform a horizontal risk management process among all areas of business of micro, small and medium enterprises. Hence, in order to achieve it, a goal oriented questionnaire embracing crucial topics concerning all types of businesses was developed. Spotrisk® application was initially composed by a goal oriented questionnaire, a project risk profile module and an advices module that generates risk strategies, according to Figure 2.17.

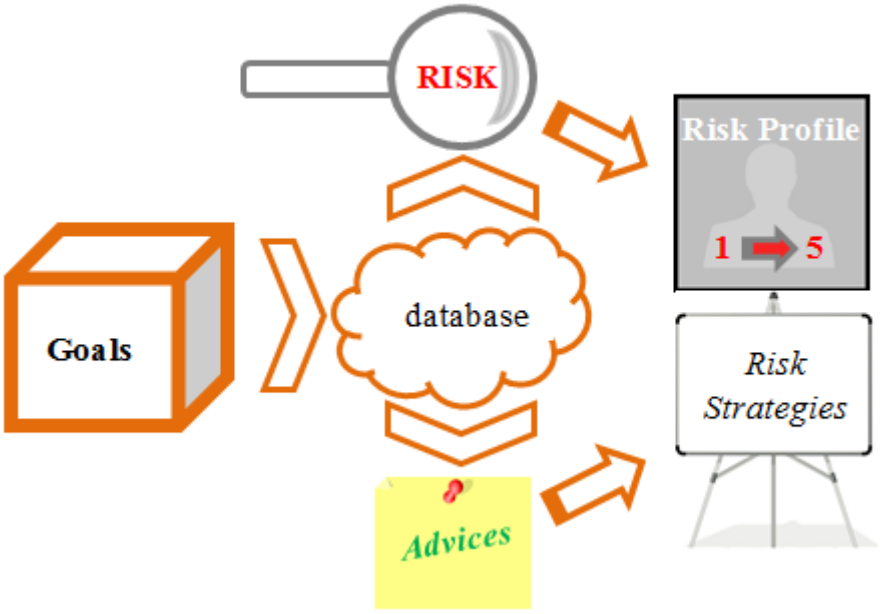


Figure 2.2 Spotrisk® global structure

This tool was developed in WS Energia S.A. a company established in Oeiras, Portugal, which designs and manufactures photovoltaic products and components for residential, commercial and industrial solar energy applications. The development of Spotrisk® started with the internal necessity of having a proper process to diagnose thoroughly and systematically the technological, organizational and business risks of projects within the company. Subsequently Dr. Jimme Keizer, creator of Risk Diagnosing Methodology, was brought on to the project in order to assist on the conception of the new born risk management and innovation facilitator application. The development of Spotrisk® constitutes a project initiated in 2009 and concluded in 2013, co-financed by QREN, PORLisboa and FEDER.

The Spotrisk® project, termed as “NPT” – New Product Thinking – was divided in 6 different phases: preliminary studies, conception, methodology development, support development, validation and promotion. This chapter, however, contemplates only the initial approach onto the project’s development and it brings enlightenment regarding the work done during the first 4 phases of the project, until the closing of support development phase. It is from this point on that this study focuses its contribution (further in this document), regarding some alterations and enhancements on the conceptual model and online platform, as well as regarding the final phases of the project: validation and promotion. Thus, this chapter will only clarify the traits of the project as they were before the initiation of this study.

The foremost attribute surrounding this application is the formed goal oriented questionnaire, with which each project’s team member assesses his/her project, generating a project risk profile as well as strategies to deal with each goal. Each aspect will be following clarified in the following sub-chapters, specifically regarding the RDM framework behind the application, the application’s

portal constitution and user's guide, the goal oriented questionnaire, the project's risk profile module, the advices module and the application's advantages and disadvantages.

2.2.5 a) Spotrisk® - RDM Framework

Spotrisk® partially integrates Risk Diagnosing Methodology's framework. As previously enlightened, RDM is composed by three different work phases: Risk Identification; Risk assessment and Risk Response Development and Control. Yet, this application comprises as an online platform and thus it thrives as a more intangible process than the whole RDM method. Also, the absence of a risk facilitator contributes to this oblique standpoint. Therefore with Spotrisk® it is not possible to reply each step of RDM, specifically steps from Risk Identification and Risk Response Development and Control phases, where the risk facilitator has a crucial role.

However, despite this impracticality, these two phases are endeavored to be automated within the web integrated system. Risk Identification, instead of being completed through meetings and interviews with risk facilitator and with project team members, it is strived to be achieved through the conception of the goal oriented questionnaire, where each question descends from a RDM reference list of potential risk issues in innovative projects and innovation process. Also, Risk Response Development and Control Risk, instead of being completed through management sessions and through the drawing of an execution plan by project manager & team and risk facilitator, it is accomplished by the generation of specific advices corresponding to risk strategies, according to the answers given in the goal oriented questionnaire.

With Spotrisk® lays an approach of attempting to center each of RDM's steps within the answering of the platform's goal oriented questionnaire, which in fact corresponds to RDM's Risk Assessment phase. This phase, besides being underlined in this specific tool by the aggregation of several aspects from the other two phases, is characterized by the development of the risk checklist, the corresponding answering by participants and by the construction of a project risk profile. Each of these steps conceptually would optimally need the help of a risk facilitator; however this platform endeavors to automate its role by exhibiting a list of key goals or questions, withdrawn from RDM's reference list with potential risk issues in the innovation process, and by generating a project risk profile according to the answers obtained.

Furthermore, the goal oriented questionnaire contains structural key aspects from RDM's Risk Assessment phase, such as the content of the checklist questionnaire, the evaluation process, the stage division, or the domains assessed, as further analyzed.

2.2.5 b) Spotrisk® - Pre-Validation Situation and Pending Tasks

The designated tool was, at the beginning of the presented dissertation, still in a development state. Consequently flaws were found, inasmuch as the development of such tool found itself before the validation phase of its development.

Flaws such as problems in user's registration process, lack of clearness in some of the questions presented in the goal oriented questionnaire, lack of clearness regarding the evaluation terms employed, complications while navigation through the portal, technical errors on the database's communication modules, technical faults in the appearance, limitations regarding the post-data analysis, lack of user guidelines, blending of Portuguese and English languages throughout the navigation process and limitations on the advices module. These flaws were rectified during the course of the presented exertion, further clarified.

In addition, in order to perform a risk assessment coherent with the groundwork purposes, an accurate application of RDM could never be performed, and thus the level of detail and effectiveness in identifying and managing risks cannot be the same as it would have been in the case RDM was consummately followed. Consequently this led to a decrease of the quality in the assessments and to the reduction of the detail on the risk's specifications, precluding a more concrete approach and driving it to a general risk evaluation and overview.

Additionally, the nature of the advices generated after each assessment is also a categorically broad approach, regarding the existing risk mitigation actions. This is due to the general and subjective nature of the questions, meaning that the answers given by the users don't provide details regarding each project, which brings difficulties in standardizing risk profiles and in universalizing the platform. A light will be shed upon each of these matters further in the following chapters.

On the other hand, this tool brings an attainment of potential positive traits and advantages matching the development's preliminary assumptions. The tool's general approach towards the risk assessment of projects is expected to bring, among other things, a readiness and rapidity of evaluation which otherwise mightn't be so effortless with other kinds of approach. As a result, the adoption of a risk questionnaire leads to a promptness of results attained simply by the process of answering to it. Also, contrarily to other risk tools, the whole process is user-friendly and quite simple, for the computation and risk analysis are performed automatically on the platform, using merely the questionnaire's answers given by the user.

Moreover a vast number of risk assessment or management tools are available under contiguous payment or fee, which comprises as a striving disadvantage inherent to such tools since most of micro, small and medium enterprises are not willing to acquire it under adjoining charge. Therefore, the fact that Spotrisk® is free of charges lies as a positive aspect of this tool.

Furthermore, the same vast number of risk tools are accessible through software acquisition and further installation, contrasting with Spotrisk® which is an online application and thus accessible via web. Lastly, the proposed tool presents questions and approaches subjects which are vital to projects, such as technology, market, finance and operations. The nature of these subjects, as well as the presented questions, provide an integrated and early stage risk perception and help

identify common potential risks of product innovation projects, aiming at the outset of a universal tool to support any kind of micro, small or medium enterprise from every area of business. A summary of Spotrisk's pros and cons is displayed on the Figure 2.15.

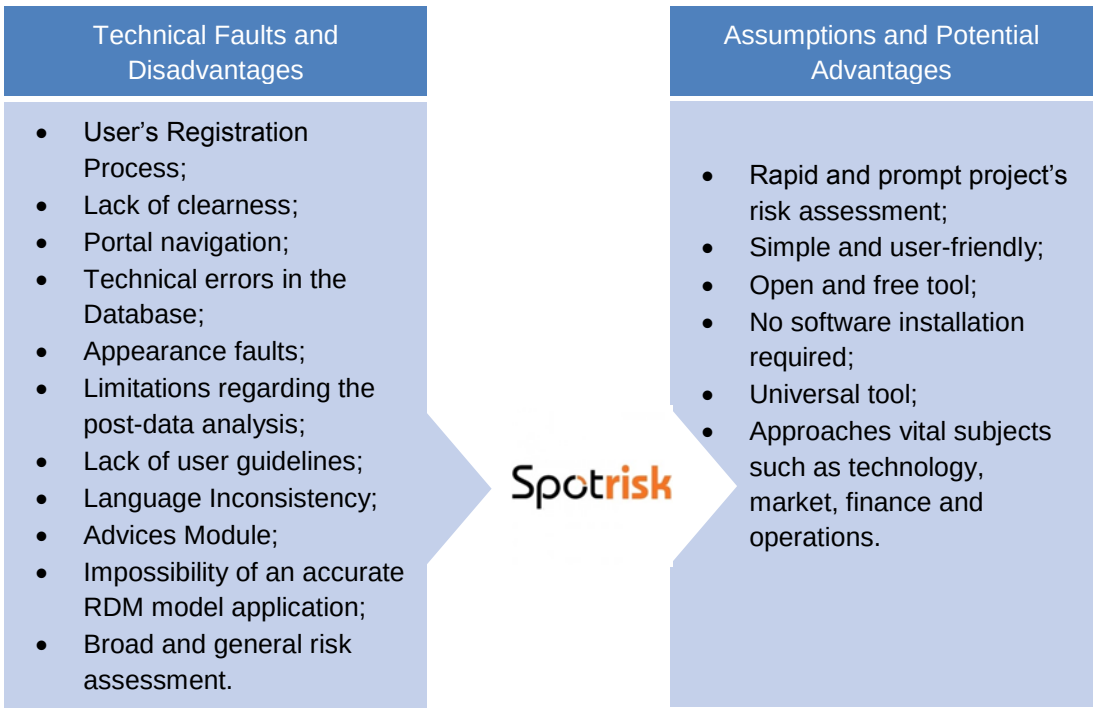


Figure 2.15 Spotrisk tool - list of disadvantages and advantages.

At this stage, as stated above, flaws and imperfections were perceived, leading the efforts to a sequence of planning, rectification and improvement of the platform. Consequently, as a groundwork purpose of this work, it is proposed to rectify and improve the technical faults found:

Along with the technical faults detected, two foremost issues identified seemed severe enough to threaten the legitimacy of the methodology. The first consisted in the condition that, at this stage, it remained as a pending operation to extend the evidence of the universality of the goal oriented issues, integrated in the platform. Thus, validation and testing need to be performed in order to verify if the generalizing nature from the questions truthfully deliver a universal risk assessment tool among different kinds of SMEs. It is then formulated the following hypothesis as a groundwork of this essay:

Secondly, the questions don't provide the users specific details regarding the assessed projects, which suggests an inherent subjectivity and which brings complications in standardizing risk profiles and consequently in universalizing the platform. In other words, each individual has a particular approach in decision making, which brings that different project-team members from the same project may give different answers in the goal oriented questionnaire, and may evaluate it differently according to their perception of the questions or even to their perception of the conditions of the same project. This is due to the idiosyncratic nature of each individual, who

perceives the world according to his/her own reality and who behaves differently according to his/her own identity. This idiosyncrasy suggests that subjects such as the individual's perception of each presented goal, individual's risk perception, individual's attitude towards risk and decision making are inly related and must considered and deliberated in order to ensure a seemly accurate risk assessment tool. Which brings us to the model of *Anchoring Vignettes,* presented and discussed on the following chapter, with the aim to control and reduce potential cognitive biases existing in the Spotrisk® tool, as well as in any questionnaire based tool.

2.3.6 *Anchoring Vignettes*

As stated before, Spotrisk's users are challenged to compare their real project with an ideal project with specific features and evaluate its level of similarity with it. This process, as well as any other questionnaire driven processes, accounts a given subjectivity and uncertainty that are dealt with heuristics, which can bring systematic errors on each evaluation. Thus, it's proposed to bring forward available literature insights about how to identify, control and reduce potential cognitive biases, in order to improve a model's consistency and to correct potential biases. Consequently, insights will be given regarding a hypothesis of model brought in by a Professor in Harvard University, entitled *Anchoring Vignettes*.

A study conducted by Gary King from Harvard University attempted to measure response category incomparability from surveys, due to linguistic imprecision or cultural bias, and to correct it. The measurements were performed through respondents' self-assessments and through hypothetical scenarios described in short vignettes, in order to correct the self-assessments without sophisticated statistical techniques (Hopkins & King, 2010; King & Wand, 2006; King, Murray, Salomon, & Tandon, 2004).

The solution to deal with incomparable answers and to reduce bias is by finding anchors and by attaching the response categories of the survey questions to some standard or anchor (Hopkins & King, 2010; King & Wand, 2006; King, Murray, Salomon, & Tandon, 2004). Gary King and his colleagues from Harvard University, in collaboration with World Health Organization, developed a methodology called *Anchoring Vignettes* in order to provide such a standard. When using *Anchoring Vignettes*, the corresponding answers provided are used to adjust people's self-assessment of a situation or concept and thus interpersonally comparable measurements are created (Kapteyn, Smith, Soest, & Vonková, 2011; King & Wand, 2006; King et al., 2004).

Vignette questions are questions about hypothetical situations or scenarios, about which respondents are asked to evaluate. For example, let's take the example introduced by King et al. in which is being studied the subject concerning the level of self-report in political involvement, participation and efficacy of governments along different countries. In this study a survey is being carried out addressing the question "How much say do you have in getting the government to address issues that interest you?". Then the possible options to answer to the self-report assessment are:

1 = *no say at all;*

2 = *little say;*

3 = *some say;*

4 = *a lot of say;*

5 = *unlimited say.*

After the self-report assessment, the vignettes are presented, which consist on additional questions describing a scenario corresponding to specific cases concerning the subject in study. Continuing with the same example, two such vignette questions are presented as following:

Vignette 1: “Alison is bothered by the air pollution caused by a local firm. It is not dangerous but sometimes leads to a bad smell. She and her neighbors are supporting an opposition candidate in the forthcoming local elections that has promised to address the issue. So many people in her area feel the same way that the opposition candidate will probably defeat the incumbent representative.” (King et al., 2004).

Vignette 2: “John is bothered by the air pollution caused by a local firm. It is not dangerous but sometimes leads to a bad smell. There is a group of influential local residents who could do something about the problem, but they have said that industrial development is the most important policy right now instead of clean air.”

Like the self-report assessment, the respondents are asked to rate the degree of political efficacy for each of the presented vignettes – Alison and John - on the same scale as used for the self-report. Moreover, the vignettes are written in the manner that Alison experiences more political efficacy than John. So let’s analyze Figure 2.19 and suppose that two hypothetical respondents – R1 and R2 – have the following assessments of how they perceive the situation regarding both vignettes and self-report.

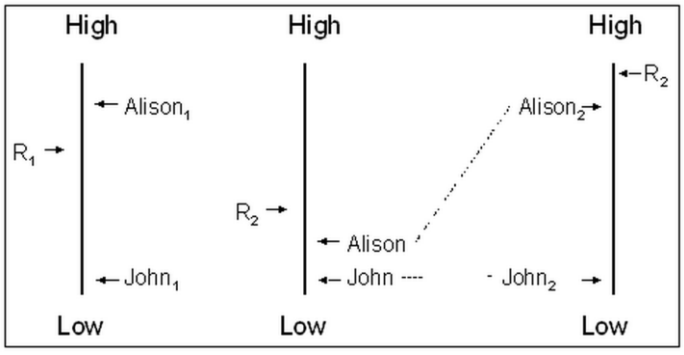


Figure 2.3 Bias correction using *Anchoring Vignettes* (King et al., 2004).

On the left side, the first respondent’s self-report assessment of political efficacy (R1) is between his assessments of Alison and John’s vignettes. On the middle, the second respondent (R2) renders a higher self-report assessment than both of Alison and John’s vignette’s assessments.

By direct comparison of the two self-assessments it is suggested that political efficacy for the first respondent is higher than the second.

However, comparing the two vignettes' evaluations shows that the respondents have very different response scales. By looking at the first respondent it is observed that he experiences less political efficacy than Alison, while the second respondent experiences more political efficacy than Alison. Therefore, by adjusting the self-assessment using the vignette answers, the right side of the figure shows a reversed conclusion, where in fact the second respondent experiences higher political efficacy than the first. Hence, with this method it is possible to re-assign and re-define the self-assessment answers relative to the vignettes, reducing or eliminating the existing bias.

In the study endeavored by Dr. King in collaboration with World Health Organization, vignettes were developed in order to study the level of political partaking and efficacy that each respondent perceives as his/her own government of having, from among 430 respondents from China and 551 from Mexico. Along with the question "*How much say [does 'name'/do you] have in getting the government to address issues that interest [him/her/you]?*", vignettes peers describing political scenarios were also presented and assessed, on a scale from 1 to 5, being *(1) No say at all, (2) Little say, (3) Some say, (4) A lot of say, (5) Unlimited say.*

The results gathered regarding the self-assessment originated a distinct perception from Chinese people as having a much more active participation on their democratic decisions than Mexican do, as it can be verified on the left graphic from the Figure 2.19 (Gary King et al., 2004).

However, realistic differences between these countries on political efficacy could hardly be starker (King et al., 2004). In 2002, date when surveys were being completed, citizens of Mexico voted out in an election, closely observed by the international community and widely declared to be free and fair. On the other hand, China is acknowledged being administered by a government who performs all decisions of national significance, and despite the existence of limited forms of local democracy, nothing resembles as the democracy appellant in Mexico.

Without knowing these facts, a standard survey would have been seriously misled (King et al., 2004). Thus, by anchoring the vignettes, developed by King's research team, the respondent's biases were corrected, being able to obtain the data presented in the right graphic of the Figure 2.20.

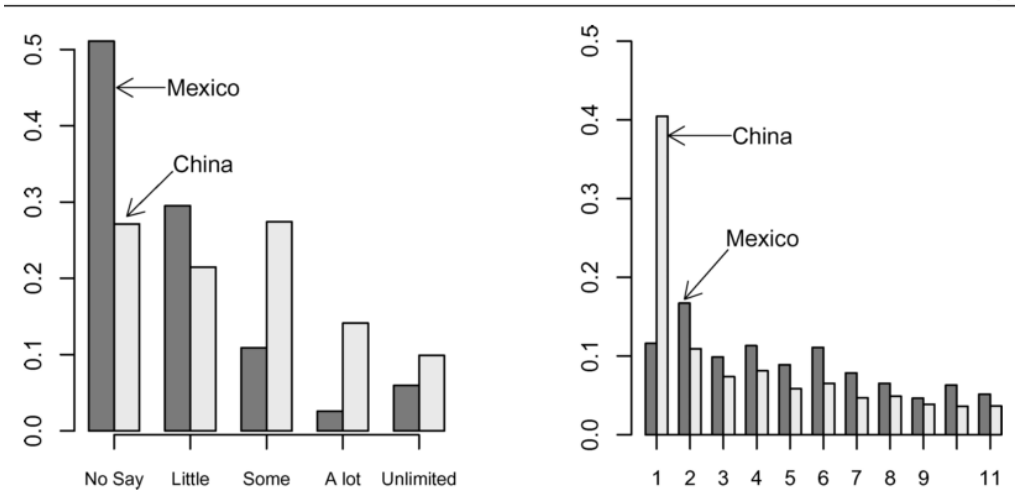


Figure 2.4 Investigation performed by ary King et al. (2004), concerning the differences between self-assessment results and corresponding rectification with *Anchoring Vignettes*.

To correct the bias it is then important to anchor the individual's perception between controlled references. Gary King and his team developed a model to control and reduce incomparability due to bias within surveys by means of a nonparametric estimator. The nonparametric estimator recodes the vignettes and self-assessment questions into a single unbiased variable C, with a scalar value for some observations and multiple values for others (King et al., 2004). It was also developed a supplementary parametrical approach to analyse such multiple variables. However, this approach won't be resorted along the present essay.

Within this nonparametric approach it's presented a simple generalization of the obtainable results. Let y be the self-assessment answer for respondent *i (i = 1,...,n)* and *zij* be the vignette evaluation on vignette j (j =1,..., J) (King & Wand, 2006).

During the course of this essay will be considered a likert scale from 1 to 5, and one peer of anchored vignettes, in which the first vignette $Z_1 = 2$ and the second vignette $Z_2 = 4$. For instance, the recoded variable "C" is assigned as 1 if the self-assessment is below both of vignettes' assessment, 2 if equal to Z_1, 3 if between Z_1 and Z_2, 4 if equal to Z_2 and 5 above Z_2.

In a general way may y be the self-assessment response and may the variables from Z_1 to Z_j be the corresponding number of a j vignette response, for a single respondent. The same discrete ordinal response choices are offered to the respondent for each of the questions, in which the vignette's anchoring and corresponding bias correction can be mathematically represented by the following equation (King et al., 2004).

$$C = \begin{cases} 1 & \text{if } y < z_1 \\ 2 & \text{if } y = z_1 \\ 3 & \text{if } z_1 < y < z_2 \\ \vdots & \vdots \\ 2J+1 & \text{if } y > z_J. \end{cases}$$

The remaining issue is how to generalize C, in order to admit tied and inconsistently ordered vignette responses. This is performed by first checking which of the conditions from the right side of equation (X) are true and then by condensing C with the vector of responses that are held as true (Gary King et al., 2004). Values of C that are intervals (vectors), rather than scalar, represent an inconsistent case in which more than one condition is true. In these cases it's not possible to distinguish without further assumptions which condition held true is the most accurate one. Hence, in this model, it's informally referred to vectors of C as being censored observations (Gary King et al., 2004).

Furthermore on Table 2.4 are represented all 13 possible combinations that can result from two vignette responses and a self-assessment. On examples from 1 to 5, both vignettes are properly ordered and not tied, resulting on C being a scalar. The vignette responses are tied in examples 6–8, producing in example 7 a censored value for C. Examples 9–13 are for survey responses that incorrectly order the vignettes.

Table 2.4 Possible combinations resulting from two vignette responses and a self-assessment.

Example	*Survey responses*	*1*	*2*	*3*	*4*	*5*	*C*
		$y < z_1$	$y = z_1$	$z_1 < y < z_2$	$y > z_2$	$y > z_2$	
1	$y < z_1 < z_2$	1	0	0	0	0	{1}
2	$y = z_1 < z_2$	0	1	0	0	0	{2}
3	$z_1 < y < z_2$	0	0	1	0	0	{3}
4	$z_1 < y = z_2$	0	0	0	1	0	{4}
5	$z_1 < z_2 < y$	0	0	0	0	1	{5}
6	$y < z_1 = z_2$	1	0	0	0	0	{1}
7	$y = z_1 = z_2$	0	1	0	1	0	{2,3,4}
8	$z_1 = z_2 < y$	0	0	0	0	1	{5}
9	$y < z_2 < z_1$	1	0	0	0	0	{1}
10	$y = z_2 < z_1$	1	0	0	1	0	{1,2,3,4}
11	$z_2 < y < z_1$	1	0	0	0	1	{1,2,3,4,5}
12	$z_2 < y = z_1$	0	1	0	0	1	{2,3,4,5}
13	$z_2 < z_1 < y$	0	0	0	0	1	{5}

This generalized definition for C clarifies the impact of ties, such as in examples 6 and 8. The key issue is what to do when C is vector valued, instead of a scalar. One possibility is to discard the vector-valued observations, wasting information. Otherwise, the parametric approach is intended to resolve this issue. However, since the current survey is arranged so that respondents can identify superior and inferior case scenarios, by principle it won't be necessary to resort such approach throughout this essay.

Hence, it can be assumed that surveys are generally valid but they may sometimes need correction due to potential linguistic imprecision and subjective judgment. Since this study focuses itself on a questionnaire, a model based on *Anchoring Vignettes*, to adjust the potential biases existing among the questions, will be further applied.

Henceforth, it is expected that a bias correction and standardization is empowered with the application of *Anchoring Vignettes*, embracing the hypothesis nº 3, clarified in detail on the following chapters.

Nevertheless, in order to adopt this method according to Spotrisk's reality, it is necessary to adjust its mechanisms and contents to Spotrisk's settings and aspects. Furthermore its application will be divided in different stages, which will comprise the model's adaptation, the creation of specific vignettes, and its validation and application, further explored and clarified throughout the progress of the present essay.

2.4 Chapter Remarks

In the provided literature review, insights concerning the support in decision-making processes under uncertainty and risk were addressed and two foremost issues were highlighted: individual's risk behavior and project risk management support tools and processes.

Firstly, concerning the individual's risk behavior, related literature review brought that while performing decisions under uncertainty, heuristic principles are employed to reduce the complexity of the probability assessment task. These heuristics are linked to biases and its reliance and trust differs according to each individual, which explains the existing variations in decision-making and risk attitude among individuals. It is accepted that attitude towards risk can be divided into a) attitude towards perceived-risk and b) risk perception. Several documents among the literature review assent that attitude towards perceived risk is consistent among individuals, while risk perception shows systematic differences. This implies that risk perception is the key variable that defines an individual's risk attitude.

Since entrepreneurs are widely recognized as risk-takers and sharp individualists, it is appropriate to assert that they generally retain a lower perception of the general risk entailed over their activities, which subsequently suggests that they are driven by a greater use and reliability over biases and heuristics among their decisions, than what managers with less entrepreneurial character tend to do.

Since these mental shortcuts in decision-making consist in a non-rational approach, some investigation was performed among neuroscience studies, which brings evidence that comprehensive and rational decision-making strongly depends on an accurate emotional processing and that conscious knowledge alone is not enough to make advantageous decisions. António Damásio introduced the notions that the VM cortex connects the emotions generated by the "primitive" brain to the stream of conscious thought, producing "hunches" and "gut feelings" that can potentially bias an individual. Thus, it is hypothesized that some of the methods used by neuroscientists among their studies can represent models to measure the degree with which an individual is predisposed to access and rely on their heuristic principles and consequent biases while performing decisions, as well as to quantify an individual's perception of risks.

Secondly, concerning the project risk management support tools and processes, the indisputable necessity to innovate brings to companies vital responsibilities, such as the inevitable errand of having consistent innovation and risk management procedures along their projects. Particularly SMEs, who are characterized by their adaptation capabilities and who takes a major role in the world's economy, need to adopt systematic processes to manage and control innovation, as well as its inherent project's risks. However the multiplicity of duties carried by managers of small businesses, as the limited number of assets generally available, pushes them away from spending resources in such activities. Yet, new product development practices, along with an

adequate team to handle them, are necessary in order to innovate. Specifically, project risk management practices are imperative to SME's subsistence and thus several methodologies and tools were brought and compared in the literature review. The tools found were either expensive or too complex and time-consuming, requiring extensively more efforts than those which managers in SMEs are generally willing to incur.

From the methodologies presented it was introduced RDM, a risk diagnosing methodology developed by Jimme Keizer from Eindhoven University, which led to the development of Spotrisk® tool, a web-based risk methodology platform designed to innovative projects of SMEs and start-up enterprises. Spotrisk® has a RDM framework basis and, through a general goal oriented questionnaire, it proposes to perform a horizontal risk management process among projects from all areas of business.

Since the platform was still in a development state, flaws and inconsistences were found, and the author endeavored on a project development in WS-Energia, to incur in the rectification and improvement of technical faults discovered in Spotrisk®.

Also, the unwillingness of evidence of the universality from the goal oriented issues integrated in the platform, remained as a pending operation to extend its validation through an adequate testing process. In addition, Spotrisk® carries an inherent subjectivity on the project's risk assessment, as well as any other questionnaire driven processes, because each individual perceives the questions according to his own idiosyncrasy, which brings complications in normalizing risk profiles and thus in universalizing the platform. Concerning this last remark, literature regarding decision-making and uncertainty was revised, concisely in how to control and reduce potential cognitive biases, in order to improve a model's consistency and to correct potential biases. Consequently, insights were given regarding a model entitled *Anchoring Vignettes*, from which a model adaptation was hypothesized.

3. Research Methodology

In the provided literature review, insights concerning the support in decision-making processes under uncertainty and risk were addressed, and two foremost issues were highlighted and presented on the framework displayed on Figure 2.1: individual's risk behavior and project risk management support tools and processes.

Concerning the individual's risk behavior, related literature review ultimately brought that, since risk behavior is hooked on risk perception and since risk perception has shown to be lower among individuals with entrepreneurial character, a methodology used by António Damásio designated *Gambling Task* will be used to attempt to verify different degrees of risk perception among different individuals. Subsequently it is conjectured the following hypothesis:

Hypothesis nº1*: Can Damásio's Gambling Task be applied as a model to measure individual's risk perception?*

Secondly, concerning the project risk management support tools and processes, it was introduced Spotrisk®, where flaws were found, which conducted the efforts into the development of a project of rectification and improving of the faults detected.

Project Development: *Planning, rectification and improvement of technical faults discovered in Spotrisk®.*

Also, the unwillingness of evidence of the universality from the goal oriented issues integrated in the tool remained as a pending operation to extend its validation through an adequate testing process, generating an assumption that also needed validation:

Hypothesis nº2: *Does Spotrisk® comprise as a valid and universal tool to support decision-making and does it reach all areas of business from SMEs?*

Additionally, after uncovering a potential incomparability of results delivered by the tool's checklist questionnaire, due to the existing idiosyncrasy of respondents, it was presented a hypothesis of control of potential cognitive biases, in order to improve questionnaire driven models' consistency:

Hypothesis nº3*: Can Anchoring Vignettes influence a project's self-assessment and reduce biased results?*

Consequently, these three hypotheses and one project development will be presented in order to enhance and improve Spotrisk®, as well as other questionnaire driven tools. The course of work will be divided on the basis displayed on Figure 3.1.

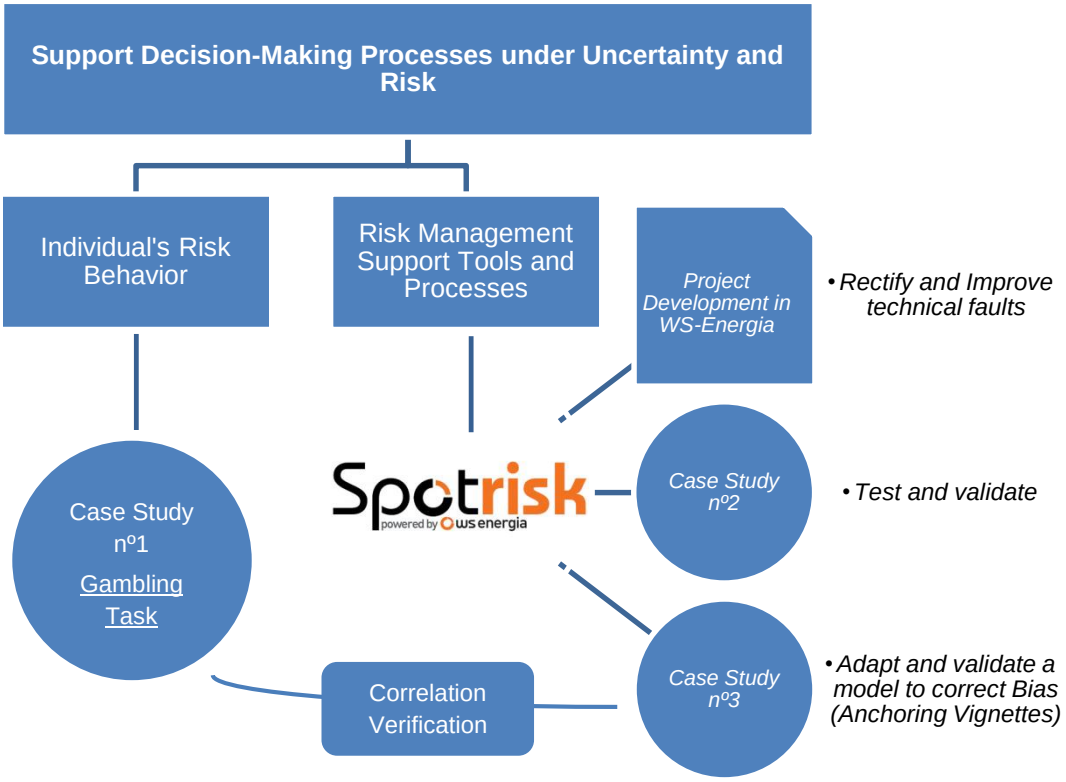


Figure 3.1 Work's division - summary.

As illustrated on the figure above, the conjectures generated will conduct the studies onto a new exploratory conjecture that inquiries whether if there is any relation between the outputs resulting from the *Gambling Task* and *Anchoring Vignettes*. Consequently, a statistical analysis will be performed in order to address the possibility of correlation between the results gathered from the case studies endeavored. Specifically, it is hypothesized whether if the number of plays performed in the gambling task are correlated with the differences between self-assessments due to vignettes' evaluation.

Hypothesis Nº4: *Is the number of plays performed in the Gambling Task correlated with the differences revealed between self-assessments?*

Thus, over the following sections will be clarified the designated models to provide support in decision-making processes under uncertainty and risk, concerning both of the chosen approaches, individual's risk behavior and risk management support tools and processes.

3.1 Individual's Risk Behavior – Gambling Task

It is recognized from related literature review that while performing decisions under uncertainty, heuristic principles are employed to reduce the complexity of the probability assessment task.

These heuristics are linked to biases, or systematic errors, and its reliance and trust differs according to each individual.

Since managers from micro, small and medium businesses generally possess an entrepreneurial character and are widely recognized as risk-takers and sharp individualists, it is appropriate to assert that they tend to have a careless and neglectful behavior towards risk, when compared to other managers (Busenitz & Barney, 1997).

Subsequently, as stated and believed by some authors from literature review (Betz & Weber, 2002; Busenitz & Barney, 1997; Cooper et al., 1988; Krueger, 1993; Simon et al., 1999) this kind of risk behavior retains a lower perception of the general risk entailed over activities, which subsequently suggests that managers with entrepreneurial character are driven by a greater use and reliability of biases and heuristics in decision-making processes, than what managers with less entrepreneurial character tend to do.

Heuristic processes consist in a non-rational approach, in which complex probabilistic assessments are performed in an unconscious region of the human brain, and are brought into conscious considerations, via emotions received by the ventromedial prefrontal (VM) cortex, which converts them into perceptions under the form of so called hunches or intuition. These feelings are therefore fruit of the heuristic processes taking place while performing decisions, and the differences in individual's reliance on these feelings explain the existing variations in decision-making and risk behavior.

Hence, since risk behavior is reliant on risk perception and since risk perception has shown to be lower among individuals with entrepreneurial character, a methodology created by António Damásio designated as Gambling Task, described above in the literature review, will be used to attempt to verify different degrees of risk perception among different individuals.

During the gambling task performed by Damásio, his neurological tools detected somatic signals in common individuals (not consciously perceived by the subjects) which anticipated their future decisions. This means that that their VM cortex had converted card selection experiences into positive emotions (A. Bechara & Damasio, 2005). During the course of the experience, Damásio was able to distinguish four different periods of performance, as subjects went from the first to the last trial in the task, as following described and represented on Figure 3.2.

1. The first was a "pre-punishment" period, before they had yet encountered any punishment during the card selection and where there were no significant somatic signals.

2. Then a second period took place, when subjects began to encounter punishment, but still had no clue whatsoever regarding what was going on in the game. Here, there was a substantial rise in anticipatory responses, even though no conscious knowledge was developed: at the beginning of the period there was a preference for the high paying

decks (A and B) but there were solid signals of hint for a shift in the pattern of card selection, away from the bad decks (A and B).

3. On the third period they were able to perceive a “hunch”, expressing a vague guess about which decks were riskier. The somatic tools detected that the shift in preference for the good decks, detected on the previous period, became even more pronounced.

4. On the fourth and last period, subjects knew in fact which were the good and the bad decks, and signals were particularly solid. The VM patients on the other hand, never reported a hunch about which of the decks were good or bad (Bechara, Tranel, & Damasio, 2000; Bechara & Damasio, 2005; Damásio, 1994).

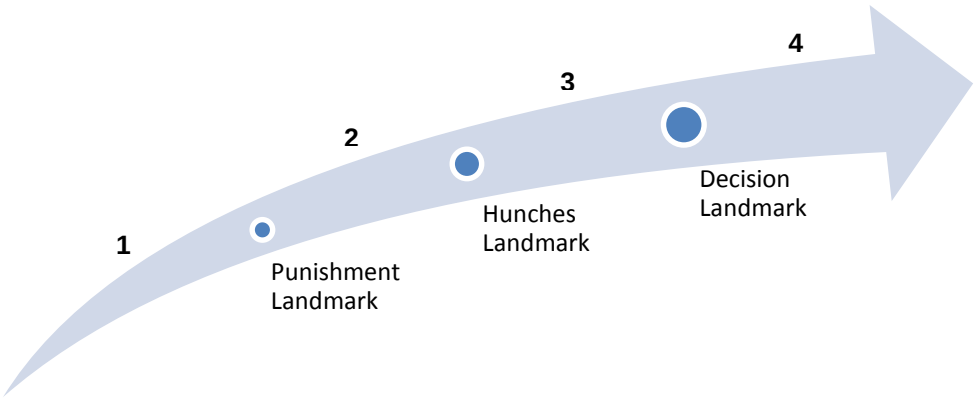


Figure 3.2 Damasio’s experience – landmarks.

This suggests that the Gambling Task can be an indicator of activated conscious or unconscious biases, resulting from previous experiences with reward and punishment. These biases help prevent the regular subject from pursuing a course of action that will be disadvantageous in the future. These biases occur before the awareness of the nature of the choice (Bechara & Damasio, 2005).

These findings comply with the presented literature review, where it’s shown that entrepreneurs behave according to their use of heuristics, along with further biases, which may significantly explain the variations in strategic decision-making and thus that entrepreneurs use biases and heuristics more extensively in their strategic decision-making than general managers (Busenitz & Barney, 1997).

Consequently, this methodology may provide a model to measure the degree with which one is apt and even predisposed to access and rely on their heuristic mechanisms and subsequent biases, and consequently a model to quantify an individual’s perception of risks. Therefore, it is formulated the following hypothesis illustrated on Figure 3.3.

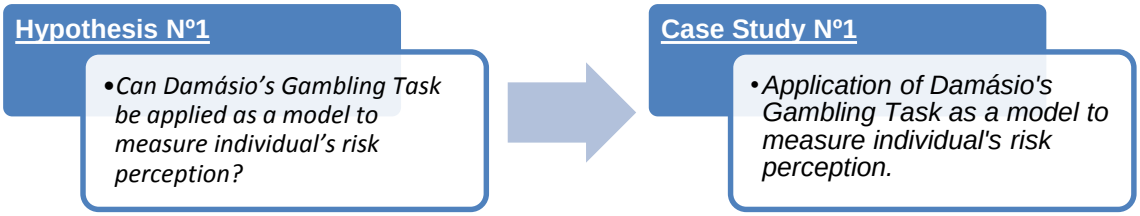


Figure 3.3 Research hypothesis nº1 – case study.

It is thus proposed the application of the gambling task to a group of individuals in order to identify an entrepreneurial character of responses and a lower perception of risk. Evidently, in the application of this task it won't be possible to gain access to neurological tools to detect somatic signals of individuals. However it is possible to know when an individual acknowledges his/her "hunches" and "gut feelings" and when relies on them to bias his/her decisions.

3.1.1. How is the Gambling Task Processed

At the beginning of the task, subjects are given an amount of real money, specifically 100€ of initial play money. In addition, the subjects are told they must take one card at a time from any of the four decks and that in each and every play they will receive a certain added amount of money, no money at all, or on certain plays they will have a punishment and need to pay a specific amount of money, according to the deck chosen. Any additional information concerning the nature of the cards' representativeness is revealed and further gaming details will have to be acknowledged by participants on their own while playing.

For example, turning any card from deck A or deck B will earn 10€, but on the third card taken out from deck A it will be charged a punishment of 15€, along with an income of 10€, yielding a loss of 5€. Or after 10 turns choosing only cards from deck A or choosing only cards from deck B, the punishments collected bring a total cost of 125€ against a profit of 100€, yielding a loss of 25€. On the other hand, on decks C and D there will be a positive income of 25€ after 10 turns.

On Table 3.1 is represented an excerpt of the map of gains and losses, available on Appendix II. This specific excerpt displays the first 10 turns for each of the decks, meaning that, for example, specifically that after taking 2 cards from the corresponding deck, on the third card there will be a loss of 5€ on deck A, a profit of 10€ on deck B, a null yield of 0€ on deck C and again a null yield of 0€ on deck D (the "0" states that no income or loss is yielded).

Table 3.1 Excerpt of the maps of gains and losses from Damasio's experience.

Choice nº / Deck	1	2	3	4	5	6	7	8	9	10
A +10			-15		-30		-20		-25	-35
B +10	0	0		0		0			-125	
C +5			-5		-5		-5		-5	-5
D +5	0		0			0	0			-25

In addition, as displayed on the complete map, it is possible to choose between a total of 40 cards from each of the 4 decks, being that global gains and losses are constant across each group of 10 choices from each deck: a loss of 25€ on decks A and B and a gain of 25€ on decks C and D. Thus, this means that after 40 turns choosing cards from decks A and B, the punishments collected bring a negative yield of 100€, and that from decks C and D will bring a positive yield of 100€ (see Appendix II).

3.1.2. How to Identify an Entrepreneurial Risk Behavior

On Damásio's experience, the goal from each individual was to maximize profit on the loan of play money according to their card choices. In contrast, in this experience each individual's objective is to maximize the profit according to the quickness that the most profitable decks are identified. In other words, in the beginning of the game it is revealed to the subject that there are some decks more profitable than others and that the aim is to stop choosing cards when the correct solution is found and when the best decks are conclusively and correctly identified. In short terms: the sooner the solution is found, the bigger is the profit.

This method urges the subject to concentrate on the rapidity of an accurate decision, minimizing exploratory card selection and maximizing the riskiness of the decision. The decision is performed somewhere in the "Decision Landmark" identified by Damásio (se Figure 3.2), in the end of the third period in which subjects are expected to perceive hunches that express a vague guess about which decks are riskier and where the somatic tools would detect preference for the good decks. Hence, the profit will be as greater as the third period is smaller.

Furthermore, the differences on the quickness of decision will depend on one's reliance and confidence over his/her "hunches" and "gut feelings", which expectably will reveal a greater or minor biased interpretation of events, along with a greater or minor entrepreneurial character.

Also, indications will be given to participants that only in case the correct decks are chosen, that the final outcome of the profit will be delivered. This will push participants into truthful considerations regarding the accuracy of choices, and thus into considerations of risk choices. Nevertheless, all data provided by participants will be gathered, in spite of the correctness of choices.

In fact, what is gathered will only be the rapidness of decision and reliance on individual's bias, disregarding the nature of the accomplished decision. In other words, the output data from the gambling task is attained according to the promptness of the decision of the decks chosen regardless if the decks are correctly chosen. Plus, in the end no money will be distributed to the participants, to a presumable and understandable disappointment.

Expectantly, the attained results from individual's profit will comprise a scale in which it will be possible to identify the respondents that most trusted on first intuition, led by their emotions, and thus the respondents that most relied on their bias on a decision-making process under uncertainty and risk.

3.2 Risk Management Support Tools and Processes – Spotrisk®

The development of Spotrisk® was carried out in WS Energia Lda., a Portuguese company that develops, produces and sells products, provides consultancy services, and conducts research and development in the renewable energy. Consequently, the urge of creating a tool to standardize and assess internal projects became a priority and evolved into a project started in 2010 – QREN11999 / WS NPT – co-financed by QREN, FEDER and PorLisboa. The project aspired to create a universal tool to support decision-making not only in internal projects, but also in projects along other SMEs and start-up enterprises of any category and natures of business.

The author's participation on the project and the resultant work presented in this dissertation began in the commencement of 2013, in a time when the project was being engaged in activities and tasks from three main project stages: Methodology Development Stage, Support Development Stage, and Validation Stage. These three stages were required to undertake a fourth stage, Launch Stage, in which the platform was disclosed and promoted. Thus, in collaboration with WS Energia, the work endeavored and presented in this thesis aimed to some degree at an analysis and improvement of the presented risk assessment tool, as well as its validation processes. Lastly, it is presented a proposal of additional conceptual enhancements, regarding subjective issues inherent to checklist surveys and other survey driven platforms or tools.

Thus, this work proposes an endorsement of the presented platform throughout three main phases, as illustrated on Figure 3.4, which correspond to the undertakings presented and exposed on the literature review:

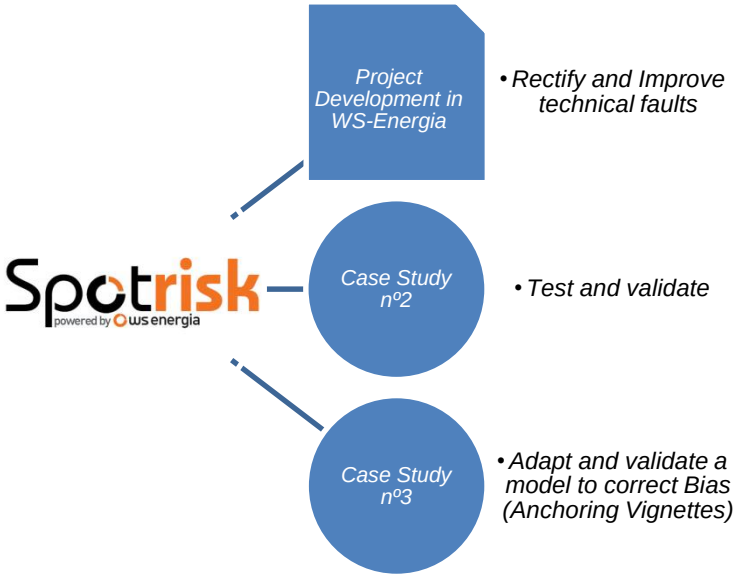


Figure 3.4 Spotrisk tool – proposed undertakings.

The first phase proposes several changes concerning technical flaws identified and modifications aiming to increase the quality of the platform's navigation process, as well as adjustments regarding the intellectual property and several goal oriented questions. The second phase consists on the validation of the functionality and applicability of the platform in order to attain a universal capability of assessing projects from a wide range of different natures. The third phase suggests the application of two approaches to enhance the legitimacy of the tool, concerning conceptual flaws identified regarding the idiosyncrasy of questionnaire's respondents, and consequent results gathered from these approaches.

This chapter provides an overview of these developments to be made and the methods used to achieve them. Furthermore, this segment will be divided in three sections. The first will analyze the Spotrisk® tool through a technical overview, processing the technical imperfections found, as well as the corrections proposed during the course of development of the web-based platform. The second section will propose actions to attain the tool's validation according to a universal process concerning different areas of business. Finally, the third section will present the solutions hypothesized to address the conceptual limitations of the methodology beneath the platform and will suggest the implementation of methods to correct biases and subjectivity along the answers given.

3.2.1 Spotrisk® - Rectification and Improvement

At this stage, as stated above, flaws and imperfections were perceived, leading the efforts to a sequence of planning, rectification and improvement of the platform's technical aspects. In this section a practical analysis throughout the technical, operational, visual and methodological features will be carried out, pointing out the enhancements to be performed, conducting the final results to be enlightened on the next chapter of results, as represented on Figure 3.5.

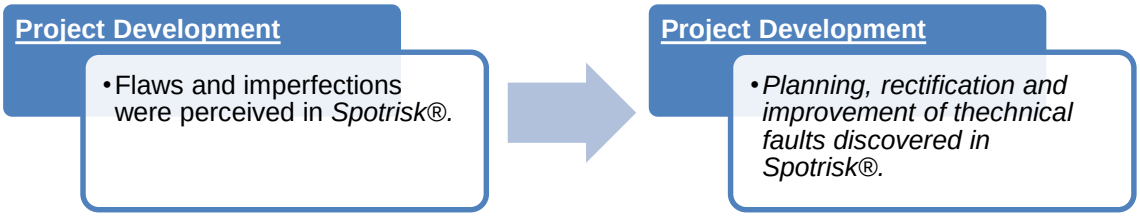


Figure 3 5 Project development origin, designation and scope.

Hence, the outcomes from the portal's examination and aspects to be improved will address the issues represented in Figure 3.6, such as the Spotrisk's portal and copyright issues, flaws detected among the platform's user profile and project sections, flaws identified in the results section, enhancements in the administrator section, the possibility of performing a comparative analysis and adjustments in the goal oriented questionnaire.

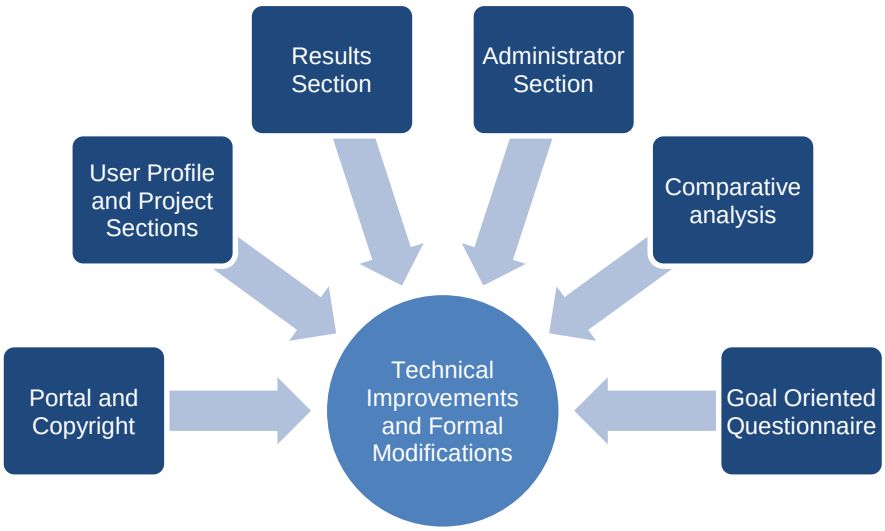


Figure 3.6 Spotrisk tool - improvements and modifications.

a) Portal and Copyright

The platform was accessed via a web portal and it was hosted and available at www.ws-ernergia.com/NPT-WSPortal/. However the navigation revealed a systematic latency during specific periods of time, which brought severe difficulties to the user's project risk assessment. Thus, a reform concerning the portal's location will be carried out in order to obtain a stable navigation. In

addition and as stated before, the project entitled NPT will be accessible to micro, small and medium business and thus renovated into a product. Hence a new designation was arranged – Spotrisk – and thus measures and procedures must be carried out in order to create a product's image and copyright.

b) User Profile and Project Sections

In the beginning of the platform the user encounters a menu to manage his/her user's details or to manage current projects. In this division were found a number of faults, such as a language inadequacy due to the lack of English display, as the lack of guidelines to help the user on his/her assessments, or as the inadequacy of the existing navigation bar made to support the user during the platform's usage. Therefore technical enhancements will take place to correct the identified faults.

c) Results Section

This approach was exceedingly confusing and visually demanding, instigating undergone changes on this section's presentation. To this negative trait contributed the excess of meaningless information regarding each goal, the lack of guidelines and a poor navigation bar. Hence, in order to improve this section, enhancements in the navigation bar, guideline instructions and consolidation of grids will be carried out, along with an enrichment of the presented visual display.

d) Administrator Section

It will also be available to administrators a section to manage the users and projects existing in the platform, as well as all the functional information of Spotrisk®. With this section it will also be conceivable to attend the possibility of performing a benchmarking analysis among the existing data, in order to compare the risk existing in projects, users, stages or goals.

e) Goal Oriented Questionnaire

Each issue presented in the checklist questionnaire could numerous times lead to doubts and inconsistency on the project's assessment, due to a middling usage of the language employed. In addition, it could also be found repeated goals or repeated topics among different goals, along the questionnaire. Hence an analysis and review, as well as further rectification of each goal will permit an improvement of the understanding of the goal oriented questionnaire.

In this goal oriented questionnaire it is also obviously important for the veracity of the outputs that the amount of knowledge and information of the respondent regarding the assessed project is vast, being this a crucial requirement and an inherent assumption to perform a truthful project risk assessment.

The goal oriented questionnaire is based on the RDM's "Risk assessment" phase, where the manager and each member of project team needs to answer to a standard risk questionnaire, in order to put forward the project's risk profile analysis and check its progress along the time.

According to several documents extant in this literature review, the nature of a risk questionnaire's issues addressed must be done according to the domains in which the innovative project stands on, as well as the area of business specified, in order to obtain an effective assessment regarding specific potential problems that may occur (Betz & Weber, 2002; Ding, 2010; Falk, 2005; Fausti & Gillespie, 2006; Rohrmann, 2005; Størdal, Lien, & Brian Hardaker, 2007). However, in order to attain this level of specificity in project's risk assessment, it's necessary to lay out resources and time that micro, small and medium enterprises may not be willing to disburse, or that simply may not possess (Keizer, Dijkstra, & Halman, 2002; Vos, Keizer, & Halman, 1998).

Also, one initial premise in this application's conceptualization was the purpose to expand the range of types of projects and businesses covered, striving to achieve a universal risk management tool towards all kinds of SMEs. Thus, in order to attain this premise, it will be adopted the approach of decreasing the resources and time consumed during the process of risk assessment, though dropping some quality features regarding the level of detail. Hence, a standardized format is desired and thus a general goal oriented questionnaire will then be developed to help identify common potential risks of product innovation projects, as proposed on the RDM's approach.

The development of the goal oriented questionnaire begun with a kick off meeting assembling NPT team members and Dr. Jimme Keizer (RDM) from the Eindhoven University, with the purpose of defining the potential risk issues within innovation processes. In this meeting were performed interviews among the company's collaborators, inquiring them about core matters they had faced or concerns they had met, regarding difficulties that might occur within projects of their own. The issues were then organized through topics among the main domains, advanced previously in Dr. Keizer's work: technology, market, finance and operations (Keizer, Halman, & Song, 2002). Henceforth, with the data gathered from the endeavors accomplished with the kick off meeting, it was possible to assemble a first list of key-questions, which would consider the foremost subjects representative of the main risks existing in innovative projects, over a vast range of SMEs. These key-questions will be organized in different stages or phases from a project, so that each segment of a project's development can be analyzed individually.

Thus, inspired by RDM's conceptual approach, the group of assembled questions will be divided into four stages: idea conception, feasibility stage, capability stage and launch stage, displayed on Figure 3.7. The remaining original stages "Post Launch Evaluation" and "Rollout Contender" will be removed. This constriction will be carried out mainly due to conceptual and theoretical factors adjacent to the definition of a project. According to PMBOK, a project is a temporary group activity designed to produce a unique product. And a project is temporary due to the fact that it has a defined beginning and end in time, and therefore defined scope and resources (PMBOK® Guide 5th Edition, 2013). Thus, as important as "Post Launch Evaluation" and "Rollout Contender" stages may be, they comprise phases and tasks contiguous to a post-project period. However, some important features from these periods, such as aftersales control, are significant to assess

a project's risk profile and thus some of these aspects will be enclosed within the goal oriented questionnaire.

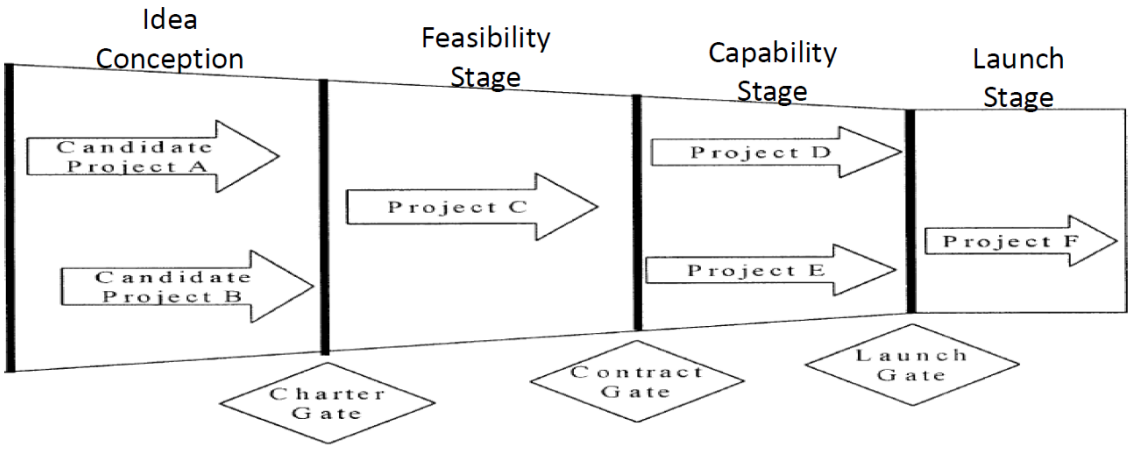


Figure 3.7 Spotrisk's approach to RDM's conceptual approach

Hereafter, the engendered and distributed questions will be analyzed and then filtered to be put forth to an initial form of the goal oriented questionnaire. After a cautious selection process, a group of 35 questions will be assembled and the questions to be included in the platform thoughtfully distributed, where each group of 3 questions will regard a specific area of the project's development and each area will consider the same particular subject.

These stages and corresponding subjects are: Idea Stage, which will comprise 12 questions and will aim to evaluate the marketing research carried out, as well as the competences available in the beginning of the project; the Feasibility Stage, will settle 9 questions and will analyses subjects such as core competences, marketing and finance; the Capability Stage will include 6 questions and mainly will analyze the realization of proposition and finance; and finally Launch stage, which sill embrace 8 questions where levels of competition, marketing and finance areas will be evaluated. These are schematized on Table 3.2.

Table 3.2 Stages from Spotrisk's goal oriented questionnaire

Stage\Questions	**1,2,3**	**4,5,6**	**7,8,9**	**10,11,12**
Idea Stage	*Value Proposition*	*Target Market*	*Core Competences*	*Competition*
Feasibility Stage	*Core Competences*	*Marketing*	*Finance*	-
Capability Stage	*Realization of proposition*	*Finance*	-	-
Launch Stage	*Competition*	*Marketing*	*Finance**	-

*finance group on launch stage is composed only by 2 questions.

In addition, each critical question will be removed and rendered into a positive statement of a goal objective, meaning that every specified goal, if realized within a project, will translate it as an ideal project and therefore as a safe project. As a result, the selected critical issues resorted within the goal oriented questionnaire will be distributed through the descripted four key staged process, from the initial idea's conception to the launch of the new product/service, concerning different project management's areas of knowledge, which so can be observed in Appendix III.

f) Comparative Analysis

The platform provides users with key issues that can harm an innovative project. However its assessment and further results can be independent and subjective if not compared with other outcomes. Hence, the platform will afford the possibility for the users to obtain feedback from a global network of other projects within the platform, aggregating and biding the information collected. Each submitted project will be stored on the database, contributing for the data collection from which every user can compare his/her project.

3.2.2 Tool Validation

The further section will describe the process of endorsement in validating the tool, in order to attain a universal platform among different areas of business. Along with the technical faults detected, the absence of validation tests could harm the legitimacy of the methodology. At this stage, it remained as a pending operation to extend the evidence of the universality from the goal oriented issues integrated in the platform. Thus, validation and testing will be performed in order to verify if the generalizing nature from the questions truthfully deliver a universal risk assessment tool among different kinds of SMEs. To accomplish that, internal and external tests will be performed, as illustrated on the Figure 3.8.

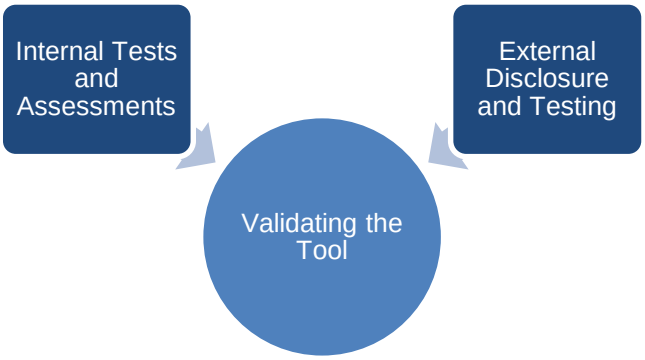


Figure 3.8 Requirements for the validation of Spotrisk's tool.

a) Internal Tests and Assessments

In order to evaluate the overall conditions of the platform, as well as to attain ideas and suitable visions as basis for further processes of strategy development, it must be carried out an internal process of testing the tool, with collaborators within WS Energia - company where Spotrisk® was developed.

Thus it is proposed the assemblage of six internal collaborators in order to award them the task of using the platform to independently evaluate different particular projects, in which each one of the collaborators may be integrated in. Each project may embrace different operating areas and components, reaching distinct fields such as operational, research & development and financial departments, being able in a first approach to provide a peer comparison and attest, in a glance, the evidence from the universal content of the goal oriented questionnaire.

Each collaborator must perform his/her project's risk assessment autonomously and independently without exchanging any type of feedback with anyone. In addition, further to the goal oriented questionnaire, it will be available supplementary answer fields corresponding to each goal, so that each collaborator may classify each issue according to its clearness and comprehension, on a scale from 1 (incomprehensible) to 5 (perfectible clear). Also it will be available an open field corresponding to each issue, so that collaborators may render comments, suggestions or any kind of feedback that they may find useful.

b) External Disclosure and Testing

Conferences and workshops can be held for a wide range of purposes, but mostly they have been held to help communities or groups of individuals transcending problematic issues and supporting action plans or decision processes. Yet, a common purpose of these thematic gatherings is also to attain ideas and visions that are suitable as a basis for strategy development processes to be carried out by a certain community (Vidal, 2009). Therefore these meetings are learning and creative substantiated processes, producing outcomes from each participant's contribution.

Aiming to test the Spotrisk® tool and check its potential coverage and utility for other organizations outside the energy cluster, a risk management workshop for start-up enterprises and SME's is thus proposed. The event is to be carried out in Madam Park, a start-up enterprises incubator in Almada, Portugal, with a maximum capacity for 15 participants. To attain the objectives proposed, the participants should cover distinct areas of business and natures of profession, from academic and non-academic fields.

In addition, due to the fact that much of the participants may not have any solid concepts regarding risk management procedures and its advantages, it is proposed to begin the workshop with a brainstorm session and with technical presentations regarding the subject of risk management. Afterwards each of the participants may try the platform at their will, with the support of Spotrisk's development team, followed by results' discussion and feedback collecting.

The feedback gathered will play an important role in the extension from the evidence of the platform's universality, and will expectantly dictate the approval or rejection of the initial premise, correspondent to the following conjecture illustrated on Figure 3.9.

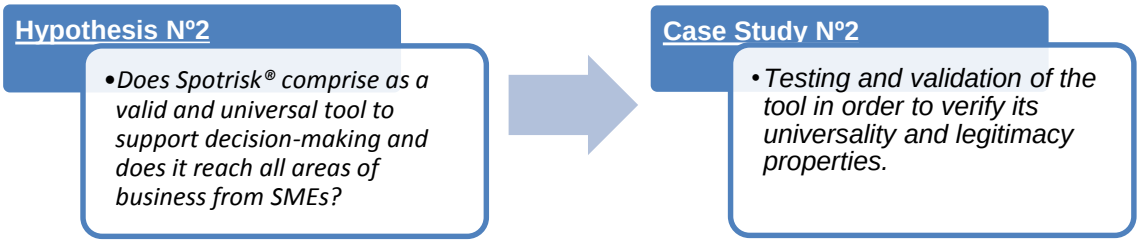


Figure 3 9 Research hypothesis nº2 - case study.

3.2.3 Model Adaptation and validation to Correct Inherent Bias

The issues presented in the goal oriented questionnaire don't provide the users specific details regarding the assessed projects, which suggests an inherent subjectivity among answers and results. In other words, each individual has a particular approach in decision making, which brings that different project-team members from the same assessed project may evaluate the same project differently according to their perception of the questions or even to their perception of the conditions of the same project.

This is due to the idiosyncratic nature of each individual, who perceives the world according to his own reality and who behaves differently according to his own identity. This idiosyncrasy suggests that subjects such as the individual's perception of each presented goal must be considered and deliberated in order to ensure a seemly accurate risk assessment tool.

As previously stated on the literature review, there is a significant discrepancy in the way different individuals interpret phrases and contexts. As a result checklist questionnaires and survey questions can bring some subjectivity in the answers and measures provided, and subsequently a model to address this issue will be applied.

Additionally, apart from investigation of subjects concerning decisions under uncertainty, presented in the literature review, and apart from the hypothesis modeled and further presented, additional revisions and text modifications were carried out regarding the structure of some of the issues presented in the goal oriented questionnaire. Specifically, the survey was submitted to a thoughtful semantic and grammatical review, as well as a contents review, aiming at providing the users a clear and rich presentation of the subjects addressed. The final result can be verified in the Appendix III.

However, this revision for itself is not enough to compensate the subjective judgment and linguistic imprecision inherent to a survey. The bias inherent to each answer influences the qualitative results of each issue and thus of the final project risk assessment, misrepresenting the validity of the results. Therefore it is necessary to find an approach to correct the existing bias of each question.

To correct the bias it is important to anchor the individual's perception between controlled references. Gary King, a Professor of Harvard University, and his team performed related literature research and ended up developing a model to control and reduce incomparability due to bias within surveys. The model is termed *Anchoring Vignettes* and, as described in the literature review, is a model to measure response category incomparability from surveys, due to linguistic imprecision or cultural bias, and to correct it.

Consequently, in order to adopt this method it is necessary adjust its mechanisms and contents to Spotrisk's settings and aspects. Furthermore its applications will be divided as it shows on Figure 3.10.

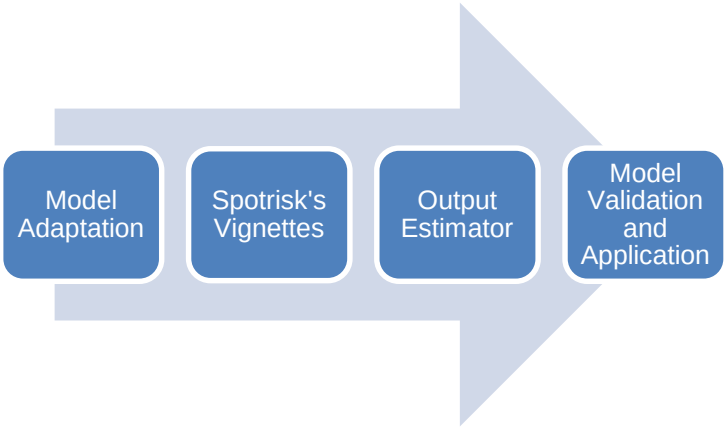


Figure 3.10 Model adaptation to Spotrisk's features – stages' courses.

a) *Anchoring Vignettes* Adopted to Spotrisk

Suchlike, in order to reduce the bias of the checklist questionnaire, adequate vignette questions had to be developed. Adding the vignette's data to the collected data regarding the perception of the respondent to the Spotrisk's questionnaire, it is possible to re-define the self-assessment answers relative to the vignette answers. As soon as a vignette peer (two vignettes) is available and assessed by the respondent, it is possible to acknowledge his view of the matter and his perception of a project's specifications and needs, and thus its project risk profile. Each question had to be cautiously considered. The existing domains affect a certain matter (such as value proposition or target market) and for each domain were created 2 hypothetical scenarios or references (vignettes). As previously stated, the goal oriented questionnaire is divided into 35 questions, separated by stages. In each stage the existing questions are organized by the management domains represented on Table 3.3.

Table 3.3 Stages, questions and topics from the goal oriented questionnaire.

Stage/Questions	Questions 1,2,3	Questions 4,5,6	Questions 7,8,9	Questions 10,11,12
Idea Stage	Value Proposition	Target Market	Core Competences:	Competition
Feasibility Stage	Core Competences:	Marketing	Finance	-
Capability Stage	Realization of proposition	Finance	-	-
Launch Stage	Competition	Marketing	Finance*	-

*Finance group on launch stage is composed only by 2 questions

Thus, for each group of three questions concerning a specific managerial area, a vignette peer was developed. In other words, regarding a defined project matter, two reference scenarios, or vignettes, were created in order to anchor the aspects of each situation. Each reference needed to be conceived with enough information for the respondent to assess to the three questions from the specified group.

For example in the idea stage, the first three questions focused on the value proposition of the idea, clarified on Table 3.4.

Table 3.4 Questions/goals presented in the topic *Value Proposition* from *Idea Stage.*

Idea stage: *Value Proposition*	1. The idea has a clear business proposition: operational, cost, product, customer or resource leadership.
	2. The idea has “springboard potential” (i.e. good prospects to become products or services).
	3. The idea has a value proposition with unique points, clear for buyers and partners

Then, two vignette cases were elaborated with enough information or with the information intended for the whole group of three questions to be attended, in order for the respondent to lock their range of conceived perceptions. The superior case scenario is describes as presented in Table 3.5.

Table 3.5 Vignette nº1 – Superior case scenario.

Vignette nº1
Ricky is a curious senior manager from a small tech company who is strongly devoted to his motivated, determined and resourceful team. They are thinking of creating an affordable mobile application to diagnose the user's skin condition, through pattern recognition technology, in which advises the user to get proper medical attention if necessary. Being that they have little serious competition, they created the following business value proposition: "One person dies of melanoma every 62 minutes. We offer a dermatoscope app for iPhone and Android that enables people to easily diagnose their skin, leveraging pattern recognition technology trusted by the World Health Organization".

It is thus asked the respondent to evaluate each of the 3 presented questions, on a scale from very low to very high, regarding the presented scenario, over the parameters presented in the checklist questionnaire: Level of Implementation, capacity to influence and severity of the consequences. For example, considering question nº1 "The idea has a clear business proposition: operational, cost, product, customer or resource leadership", concerning Ricky's tech company and its characterization, the respondent is supposed to rate his perception the aspects shown on Table 3.6.

Table 3.6 Analysis of the first question/goal concerning the superior case scenario vignette.

***Idea stage - Value Proposition* - Question nº1 -** "The idea has a clear business proposition: operational, cost, product, customer or resource leadership"		
Level of implementation:	**Capacity to influence**:	**Severity of the Consequences**:
Does Ricky's project present a clear business proposition?	Are Ricky's project team members able to garantee the accomplishment of a clear business proposition or to modify it, within the time and resource limits?	How potentially negative is the impact on Ricky's project, in the case he doesn't have a clear business proposition?

Each of the assessments is based on a "Very Low", "Low", "Medium", "High" or "Very High" scale. Let's say that respondent considers that Ricky doesn't have a clear business proposition, but that his project-team is likely to influence the project status on that matter, and that the severity of

negative consequences are considerable in case that he lacks of a clear business proposition for his project. In this case the respondent could evaluate as “Very Low”; “Very High”; and “Very High”, respectively, to each of the parameters. The same way that it could be measured it as “Low”, “High”; and “High”, depending on one’s perception and judgment. The same reasoning is used with question nº2 and question nº3, with the same arguments across parameters, similarly regarding Ricky’s company.The same logic is applied on the second vignette, described on Table 3.7.

Table 3.7 Vignette nº2 – Inferior case scenario.

Vignette nº2
Moses has a marketing company with a team of few members, from different professional areas. They are thinking of creating a pillow incorporated with a dedicated alpha-waves frequency transmitter to decrease the electrical brain activity, attempting to quickly achieve a person’s deep relaxation state. Their value business proposition is: “Aimed at an ease state of sleep we endeavored your pillow using alpha-waves transmission to fastening your brain into a low activity effectiveness cycle

Likewise, it is asked the responded to evaluate each of the 3 presented questions, on the same scale from very low to very high, regarding this new scenario of Moses’ marketing company, over the same parameters: Level of Implementation, Capacity to Influence and Severity of the Consequences. Now let’s consider Moses’ marketing company and the characterization given. The respondent is now supposed to rate his perception regarding the same parameters, as shown on Table 3.8.

Table 3.8 Analysis of the first question/goal concerning the inferior case scenario vignette.

***Idea stage - Value Proposition* - Question nº1 -** “The idea has a clear business proposition: operational, cost, product, customer or resource leadership”		
Level of implementation:	**Capacity to influence**:	**Severity of the Consequences**:
Does Moses's project present a clear business proposition?	Are Moses’s project team members able to garantee the accomplishment of a clear business proposition or to modify it, within the time and resource limits?	How potentially negative is the impact on Moses’s project, in the case he doesn’t have a clear business proposition?

The assessment is performed suchlike the first vignette, on the same “Very Low”, “Low”, “Medium”, High” or “Very High” scale. The responses acquired depend the same way directly on the respondent’s perception and judgment. Also, the same reasoning is used throughout question nº2 and question nº3.

Moreover, apart from the vignettes responses, self-assessment report information relatively to the actual project from the respondent is also asked (on Spotrisk’s questionnaire). In this case the logic is exactly the same, but instead of having a vignette shaping a project’s scenario, the actual project’s setup scenario is being analysed through the respondent’s idea and perception of it. This is processed through mental heuristics previously stated on the literature review.

Thus, through Spotrisk’s checklist questionnaire it is asked the responded to evaluate each of the 3 presented questions, on the same scale from very low to very high, but now regarding the scenario of their own project (self-assessment), over the same parameters: Level of Implementation, capacity to influence and severity of the consequences. Now there is no characterization given, and the judgment of the project’s features comes only from the respondent’s perception of it. The respondent is likewise supposed to rate his perception regarding the same parameters described on Table 3.9.

Table 3.9 Analysis of the first question/goal concerning an individual’s own hypothetical project.

***Idea stage - Value Proposition* - Question nº1 -** “The idea has a clear business proposition: operational, cost, product, customer or resource leadership”		
Level of implementation:	**Capacity to influence**:	**Severity of the Consequences**:
Does my project present a clear business proposition?	Are the members of my team able to garantee the accomplishment of a clear business proposition or to modify it, within the time and resource limits?	How potentially negative is the impact on my project, in the case I don't have a clear business proposition?

Each goal is assessed according to the 3 different parameters, which divides each goal in 3 different smaller questions, each of them with the need to be analyzed with both the self-assessment and 2 vignettes, performing 3 analyses in each parameter examination. Hence, in order to simplify the discourse, let’s call a singular analyzes of a singular parameter, through a single project scenario, as a “unitary response”. Consequently, once the respondent finishes assessing one goal, we collect 3 parameter answers along 3 different scenarios (vignette nº1,

vignette nº2 and the self-assessment), generating 9 unitary responses, as illustrated on Figure 3.11.

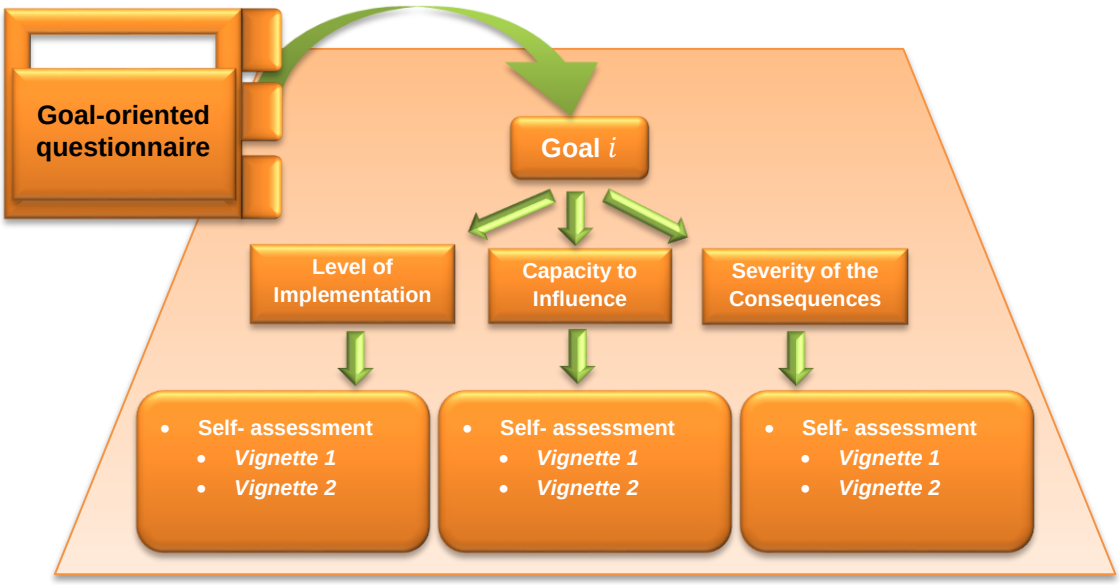


Figure 3.11 Parameters assessments.

Let's analyze one single parameter answer, with the inherent 3 unitary responses (scenarios), for example the parameter "Level of Implementation" of the first goal from the idea stage: "The idea has a clear business proposition: operational, cost, product, customer or resource leadership".

Let's now suppose that the respondent considers Ricky's project as having an average business proposition, rating it as "Medium". Let's also imagine that, on the other hand, Moses's project is seen by respondent as having a very poor business proposition, rating it as a "Very Low".

Finally set's say that the self-assessment performed by responded is translated as a "Low" rating, regarding is own business proposition. We now have 3 different results, or unitary responses, that can be represented in diagram represented on Figure 3.12.

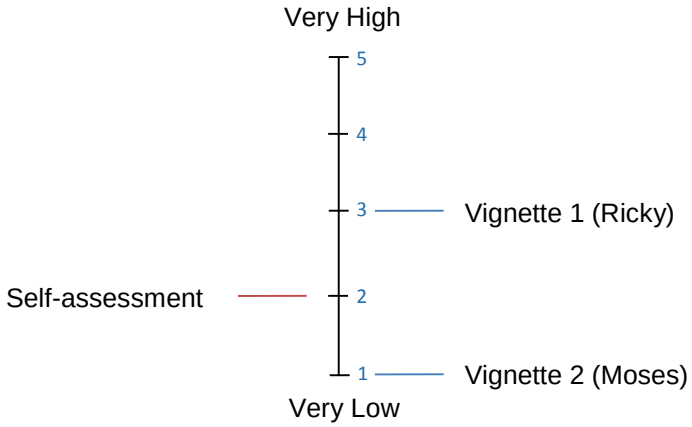


Figure 3.12 Unitary responses ordered by its evaluation from 1 to 5.

The self-assessment, rated as “Medium” and thus on the second position of the scale, is on the scale between the two assessed vignettes, rated as “Very Low” and “Medium”, respectively on the first and third positions of the scale.

Since the reported answer to the self-assessment question includes both the actual level of the project’s business proposition and the bias associated with the answer, it is not possible to separate the two without further information. Thus, the anchoring vignette’s answers provide that additional information needed.

The vignettes were cautiously built in order to belong to a certain rating. This rating is fixed and attributed specifically to this model. Each vignette peer symbolizes two descriptive scenarios (in this case Ricky and Moses’) representative of two different and locked projects attributions, defined within the development of this work. In each vignette peer there is always a superior case scenario with a fixed rating of 4, or in this specific case as “High”, and an inferior case scenario with the fixed rating of 2, or in this case “Low”. However, the respondent is not familiar with that information and he exposes his bias, according to his perception of each vignette’s description. With this information we are able to anchor and lock the perception of the respondent, and thus control his disruptive bias.

Hence, the anchoring vignette answers provide the information needed to separate the actual level of the project’s business proposition and the bias associated with the answer, because Ricky has the same actual “Level of certainty” of his project’s business proposition no matter what any respondent perceives.

Thus, any systematic variation in answers about Ricky’s project can only be due to bias. By assuming only that the bias that a respondent applies to his or her self-assessment is the same as the bias that this person applies to the vignette question, it is possible to ‘‘subtract off’’ the bias from the self-assessment to yield an unbiased estimate of the actual level the project’s business

proposition of the respondent. This way it is possible to re-assess the project and input an actual and unbiased answer, exemplified in the diagram from Figure 3.13.

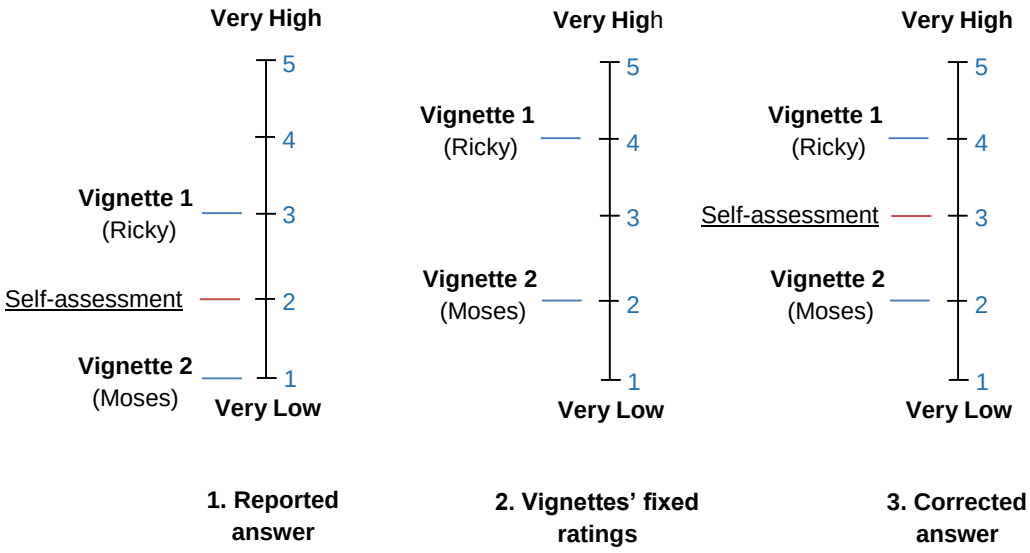


Figure 3.13 Rectification of the self-assessment according to the anchored vignettes.

In the middle scale it is represented the rating of both anchored vignettes, which is used to adjust the respondent's reported answers represented on the left figure. This adjustment leads to the scale representation on the right side of the figure, where we can see that the reported self-assessment was underrated by the respondent and that a "Medium" (3) answer would be more accurate, according to his perception of the vignettes.

b) Content of Each Vignette

The vignettes description plays an important role within this method, which leads to a careful attention regarding its elaboration. As previously presented on Figure 3.13, each vignette applies for the generation of 3 unitary responses per goal, comprising the evaluation along 3 the different parameters.

Each superior and inferior case scenario is represented by Vignette 1 and Vignette 2 respectively. Anchored vignettes are rated according to the table below, being attributed the same ratings for each group of vignettes along the whole questionnaire, without the acquaintance from its respondents.

A clear representation of this paradigm is represented on Table 3.10.

Table 3.10 Qualitative and numeric representation of each inferior and superior case scenario vignette, along the goal oriented questionnaire.

Vignette\Parameter	**Level of Implementation**	**Capacity to influence**	**Severity of the consequences**
Vignette 1	High	High	High
Vignette 2	Low	Low	High
Vignette 1 (scale)	4	4	2
Vignette 2 (scale)	2	2	2

In order to adequately anchor each vignette, each scenario needed to possess a rigorous description according to concise criteria along the whole questionnaire. The criteria used in describing each vignette was based in management guidelines and standardized models of project management, innovation management and new product development, mentioned in the literature review.

Nevertheless this is the author's vision and perception, which defines every vignette and subsequently anchors every answer from the questionnaire. Consecutively, each respondent will have his/her personal perception and bias according to the vignette, from which each answer will be modeled according to the same fixed criteria, established by the author.

For instance, in regards to the superior case scenario's Vignette, corresponding to the first question of the goal oriented questionnaire, it refers to the clearness of business proposition in Ricky's project of creating a mobile application to diagnose the user's skin condition. To each parameter was given the proper rating according to the amount of representativeness presented in the vignette's description, specifically shown on Table 3.11.

Table 3.11 Level of implementation description

Level of Implementation: ***High (4)***	Level of implementation states how much representativeness of the specific goal the project already has or that will have. Since Ricky's project has a "High" Level of implementation (4) it thus implies that his project's representativeness to an acceptable business proposition is adequate, according to the presented literature review.

A business proposition is a promise of value to be delivered. It's the primary reason from which the referred prospect should be acquired by someone (Ballantyne, Frow, Varey, & Payne, 2011). It should be a clear statement that:

- explains how the product solves customers' problems or improves their situation;
- delivers specific benefits;
- Tells the ideal customer why they shouldn't go to the competition;

- It can be read and understood in about 5 seconds.

Also, a clear business proposition should be something that normal people could easily understand, instead of the meaningless jargon-propositions often applied. The value proposition must reflect real information from actual customers and show how the specific offering will address the pain point and what value that has for the customer (Ballantyne et al., 2011).

Now let's analyze the value business described in Ricky's project: "One person dies of melanoma every 62 minutes. We offer a dermatoscope app for iPhone and Android that enables people to easily diagnose their skin, leveraging pattern recognition technology trusted by the World Health Organization". It is fair to say that the rated value is worthy of its description and that there is a reasonable amount of representativeness between Ricky's business proposition and an actual business proposition, according to literature review. Reasonable but however not strong enough to be rated as "Very High" (5), for Ricky's business proposition lacks in some competition information and it probably takes more than 5 seconds to be read and understood.

Furthermore, the second parameter addresses the capacity to influence that each team has as it follows on Table 3.12.

Table 3.12 Capacity to influence description

Capacity to Influence: ***High (4)***	The capacity to influence represents the ability of the project team to guaranty the accomplishment of the project's goal, within the time and resource limits. Since Ricky's project team has a "High" Capacity to influence (4) it thus implies that his project teams' representativeness to an acceptable team capability is adequate, according to the presented literature review.

Summed up, a highly competitive and competent team must attain managers and functional participants to elevate integrative process into collaborative process. An important role is played by cooperation, collaboration, and communication between all the organizational departments for the R&D project's success, as well as several elements stated in the literature review.

Thus, vignettes' description regarding Ricky's project refers to Ricky as a "curious senior manager" who is "strongly devoted" to his team. Furthermore it refers to his team as a "motivated, determined and resourceful team". This brief description, according to our judgment regarding the presented literature review, is meaningful to explain the rated value regarding Ricky's capacity to influence in his project. It is however not solid enough to be rated as "Very High" (5), which in order to be so, it had to exist total representativeness regarding each identified element contributive to an integrative process.

The last parameter, severity of the consequences onto a project's success or failure, is addressed on Table 3.13.

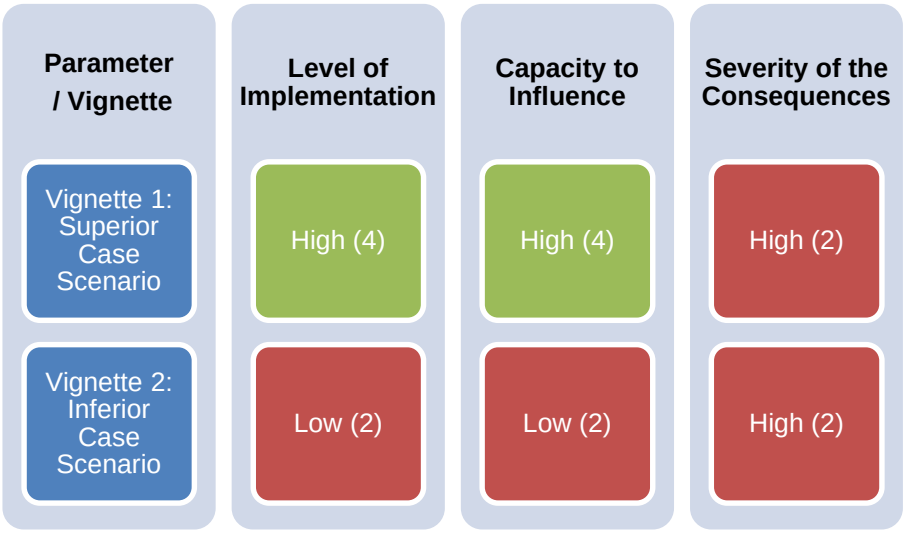
Table 3.13 Severity of the consequences description

Severity of the consequences : ***High (2)***	Severity of the consequences represents the potential level of negative impact on the project's performance by not attending to the specified goal. Since Ricky's project has a "High" (2) it thus implies that the direct consequences by not attending to a clear business proposition are significant to the project's success, according to the presented literature review. It's important to remember that the scale from the Severity of the consequences behaves the opposite way as the other two cases, for while responding the same way (high), the numerical representation corresponds to the value "2" instead of "4", behaving according to an inverse proportionality. This conduct is due to the fact that the higher is the severity of the consequences, the riskier is the project.

Since each question in the goal oriented questionnaire represents substantially important milestones or requirements within a project's formal procedures, both conceived vignettes for superior and inferior case scenarios are rated as "High", among the severity of the consequences in case the specified goal is not attended. This implies that both vignettes are anchored by the same value, which means that the bias correction cannot be applied in the parameter "Severity of the Consequences".

In other words, on the two parameters left behind, level of implementation and capacity to influence, there were two different values anchoring the answers given: High (4) and Low (2) for the superior and inferior case scenarios, respectively. This provides the possibility to apply the *Anchoring Vignettes* and to correct the bias inherent to the answers given. However, in the present parameter, such is not conceivable for the reason that the correct answers given for superior and inferior case scenarios are the same – High (2) – as clarified on 3.14.

Table 3.14 Anchored ratings for both of vignettes' assessed parameters.



This approach is engaged in every vignette for each parameter, along the whole goal oriented questionnaire. Each superior case scenario vignette is rated as "High; High; High" (4; 4; 2), while each of the inferior case scenario, such as Moses', is rated as "Low; Low; High" (2; 2; 2), as presented in table 3.13. The entire list of created vignettes is available on Appendix IV.

c) Validation and Application of the Model's Conjecture

With this methodology it is expected that, apart from the bias correction, users can have the possibility of a more tangible approach towards the goal oriented questionnaire, being that merely by reading the vignettes, respondents are more eager to understand questions as intended, as well as to answer them appositely.

However certain details are probed, such as question wording and the order of self-assessment and vignettes. Hopkins and King (2010) developed improvement studies regarding *Anchoring Vignettes* where they show that if vignette questions are performed first, followed by self-assessments, it primes respondents to define the response scale in a common way. In this case, priming is not a bias to be avoided but means of better communicating the question's purposes (Hopkins & King, 2010).

Also it is shown that each vignette peer should be randomly displayed in the course of answering vignettes, due to the fact that, in case it doesn't, respondents can effortlessly identify the superior and inferior case scenario, through the logic of display order and not by vignette content, thus denouncing the perception and assessment within the method.

With this method it is intended to anchor the results according to a common scope of perception, in order to reduce the idiosyncrasy in responses and consequently to reduce the volume of biased results. Consequently, allied with *undertaking* nº3 assigned to develop and validate a model to

correct the bias associated with answers given in Spotrisk, it's formulated the following hypothesis represented on Figure 3.14:

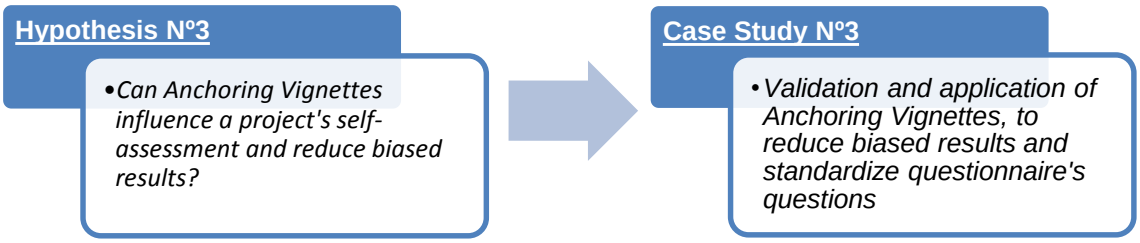


Figure 3.14 Research hypothesis nº3 - case study.

AIn order to verify this conjecture, a group of collaborators, managers and members from micro, small and medium businesses will be individually drawn and summoned to participate in a test and validation of the adapted model of *Anchoring Vignettes*.

In a first stage, a specific portion of Spotrisk's goal oriented questionnaire will be presented to the participant, where he/she will assess autonomously a real project from his/her own actual labour activity, preforming a self-assessment in the platform without being acquainted with the existence of the vignettes. Afterwards, the corresponding vignettes will be presented and assessed accordingly, followed by a replication of the self-assessment. Then an analysis of responses will be carried out in order to verify whether if modifications of values in self-assessment answers took place, and to quantify these modifications. This process is represented on Figure 3.15.

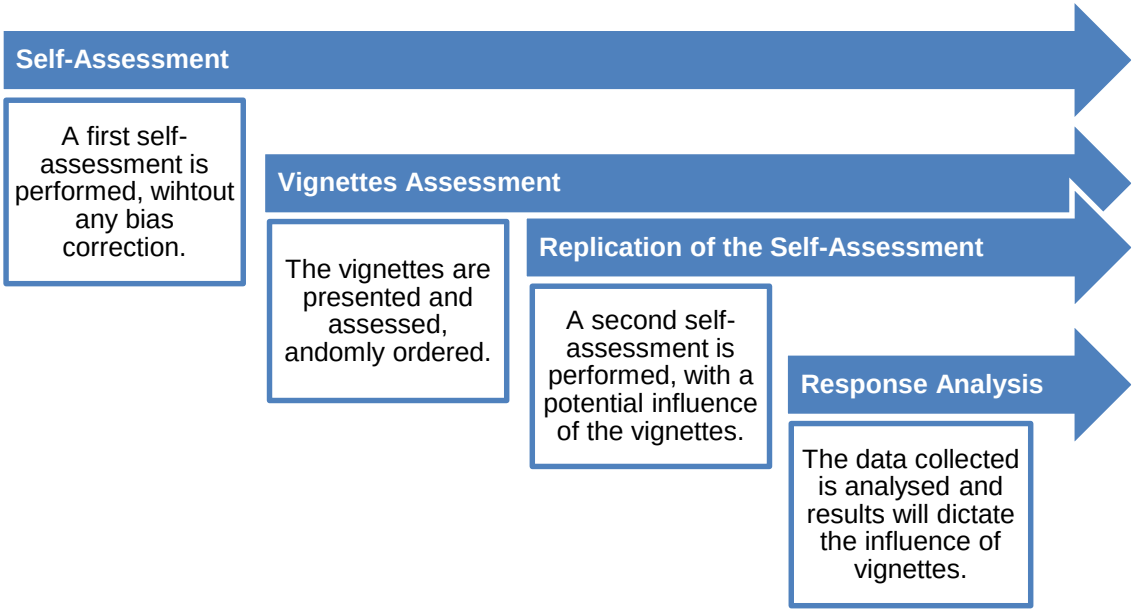


Figure 3.15 Model of implementation of *Anchoring Vignettes* into the Spotrisk's goal oriented questionnaire.

Thus, with this model it's expected to confirm differences in the answers collected in the goal oriented questionnaire. However, in this study it is not intended to verify if the changes of answers collected correspond to a truthful reflection of the project's reality and actual tendency of a project's risk. In order to do that, this study would need to collect different information and concise material from each assessed project, for an extensive period of time.

In addition, as stated above, only a fragment of the goal oriented questionnaire will be showed to the participant and further analyses undergone, due to the magnitude of the requested task. To perform this task, the participant will be asked to attend to an initial phase of self-assessment where he/she will evaluate a designated project according to five goals and three respective parameters, as displayed on the table below. The selected goals, as presented on Table 3.15, were selected by its dissimilar nature from one another, embracing the different junctures from the goal oriented questionnaire.

Table 3.15 Selected goals to attend to by each participant.

Participant	Level of Implementation	Capacity to Influence	Severity of the Consequences
Self-Assessment nº1			
S01-G01 Idea Stage: Value Proposition	- Select Item -	- Select Item -	- Select Item -
S03-G04 Capability Stage: Finance	- Select Item -	- Select Item -	- Select Item -
S02-G05 Feasibility Stage: Marketing	- Select Item -	- Select Item -	- Select Item -
S01-G09 Idea Stage: Core Competences	- Select Item -	- Select Item -	- Select Item -
S04-G03 Launch Stage: Competition	- Select Item -	- Select Item -	- Select Item -

On a second phase of assessment the participant will be asked to evaluate the vignettes corresponding to each of the assessed goals above, followed by a second evaluation of the goals. Each assessment will be once more according to the three entitled parameters, as presented on the Table 3.16.

Table 3.16 Order of tasks requested to each participant to attend to.

Participant	Level of Implementation	Capacity to Influence	Severity of the Consequences
Vignette nº1	- Select Item -	- Select Item -	- Select Item -
Vignette nº2	- Select Item -	- Select Item -	- Select Item -
Self-Assessment nº2			
S01-G01 Idea Stage	- Select Item -	- Select Item -	- Select Item -
Vignette nº17	- Select Item -	- Select Item -	- Select Item -
Vignette nº18	- Select Item -	- Select Item -	- Select Item -
Self-Assessment nº2			
S03-G04 Capability Stage	- Select Item -	- Select Item -	- Select Item -
Vignette nº11	- Select Item -	- Select Item -	- Select Item -

Vignette nº12	- Select Item -	- Select Item -	- Select Item -
Self-Assessment nº2			
S02-G05 Feasibility Stage	- Select Item -	- Select Item -	- Select Item -

Vignette nº5	- Select Item -	- Select Item -	- Select Item -
Vignette nº6	- Select Item -	- Select Item -	- Select Item -
Self-Assessment nº2			
S01-G09 Idea Stage	- Select Item -	- Select Item -	- Select Item -

Vignette nº19	- Select Item -	- Select Item -	- Select Item -
Vignette nº20	- Select Item -	- Select Item -	- Select Item -
Self-Assessment nº2			
S04 - G03 Launch Stage	- Select Item -	- Select Item -	- Select Item -

Hence, 19 participants will be invited to pay contribution for the present research. Each participant will be requested to evaluate a total of 60 items, which will provide substantial data to engage on a stage of data analysis, where it is expected to verify differences in the answers given before and after the application of vignettes.

d) Verification of Correlation Between Delivered Results

The nature of models applied and subjects studied suggest that they may be linked in numerous traits. Unerringly, the exploratory investigation concerning the subject of individual's risk behavior and the corresponding model of *the Gambling Task* can be related with some risk management support tools and processes such as the outputs from the application of *Anchoring Vignettes.*

The application of the Gambling Task urges the subject to concentrate on the rapidity of an accurate decision and maximizing the riskiness of the decision, whereas the differences on the quickness of decision will depend on one's reliance and confidence over his/her "hunches" and "gut feelings", which expectably will reveal a greater or minor biased interpretation of events, along with a greater or minor entrepreneurial character. Consequently, it is expected that this behavior is somewhat related with some of the answers given during the application of *Anchoring Vignettes,* conjecturing the following hypothesis:

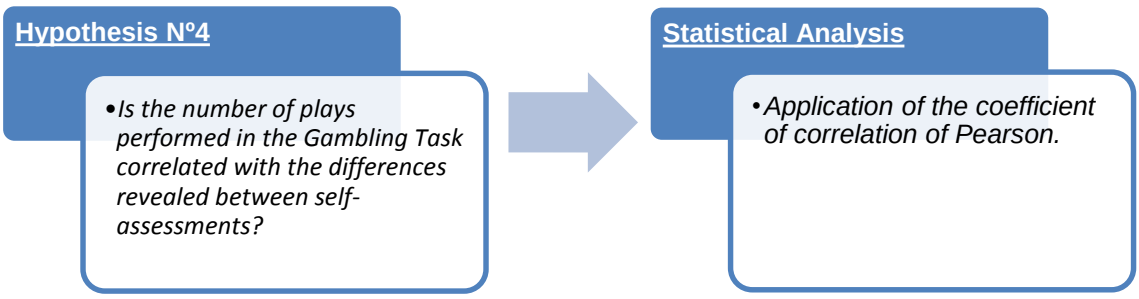


Figure 3.16 Research hypothesis nº4 – proposed method.

Thus a statistical analysis will be put forth, using a descriptive bivariate analysis and using the software of statistical analysis PASW Statistics, version 18.0. Two foremost variables will be used:

- υ_1 = the number of plays, from the *Gambling Task,* per participant;
- υ_2 = an indicator resulting from the sum of the variation in answers from both of self-assessments performed along the *Anchoring Vignettes.*

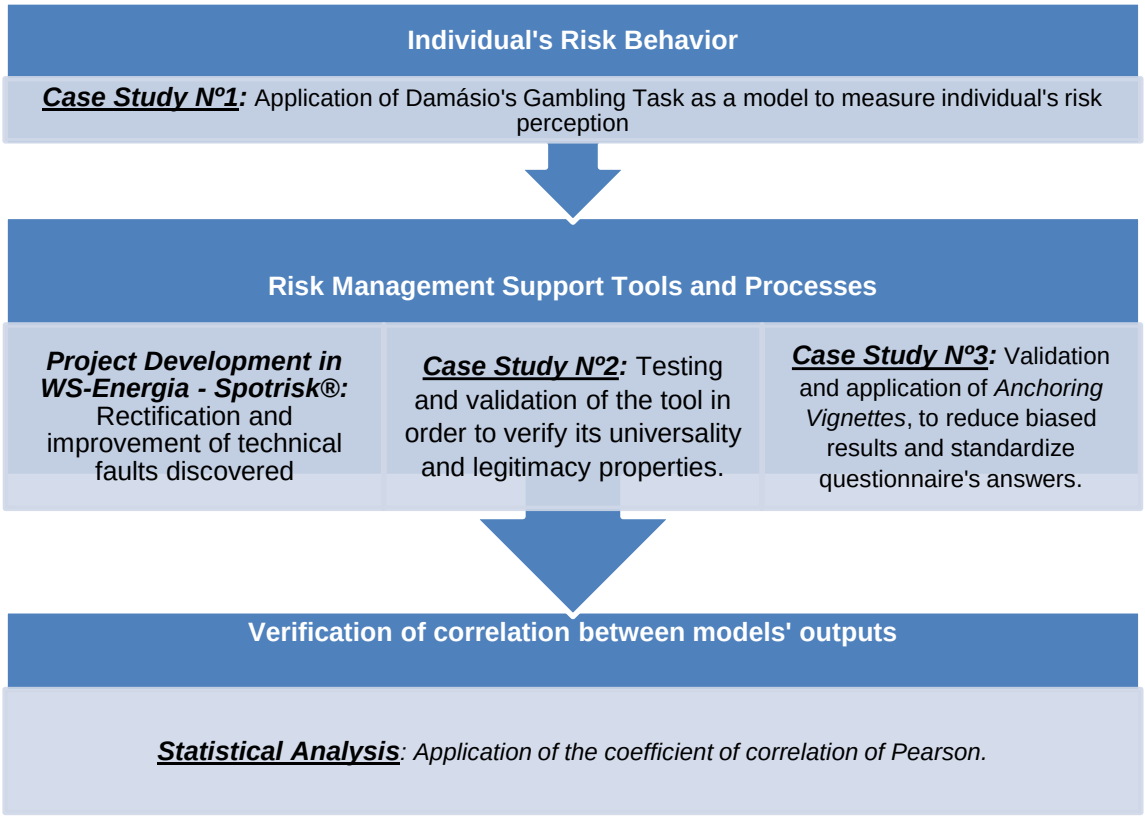
The designated indicators are variables with a nature of quantitative measurement, being υ_1 a tangible result of the number of plays and υ_2 a difference of answers among a likert questionnaire, which just by itself can be treated as such. Consequently, it will be ensued to calculate the index of correlation of Pearson (R) to determine the level of correlation between these two variables.

4. Main Studies' Results

As previously stated, this work is contextualized within a project of a Portuguese company, where one of the present exertion's main focuses is to attain the development of a decision support and risk assessment tool designed to SMEs and start-up enterprises, as well as to undertake efforts to validate and improve it. Alongside with these efforts, an academic investigation was carried out to study and to bring insights concerning the subjects of uncertainty and decision-making, as well as individual's risk behavior.

Consequently, the research endeavored led to different conjectures and, as a result, hypotheses were formulated, which conducted the line of work into the development of models to inset resultant case studies. Henceforth, results were gathered and further presented in two categories "Individual's Risk Behavior" and "Risk Management Support Tools and Processes", from which a sample of nineteen collaborators from SMEs, start-up enterprises and incubators were invited to participate, as distributed in Table 4.1.

Table 4.1 Hypotheses formulated on the research



The sample used in the presented case studies cannot be seen as representative of the group of companies that structure the universe of micro, small and medium enterprises. This is due to the extreme difficulty in having the same and equal level of cooperation among all companies from

the universe of the target companies, from which it is then not possible to build randomly a representative sample.

However, even with the constraint of not being feasible to extrapolate or infer statistical conclusions, the exploratory nature of this study aims essentially at the applicability from the presented models, more than the answers gathered, which justifies the presented descriptive analysis.

Hence, on this next chapter, the outcomes from such efforts will be demonstrated, following the outlines of the previous chapter in order to attain an enhanced comprehension of the progresses undertook and confronting the hypotheses formulated over each of the case studies endeavored.

4.1 Case Study in Individual's Risk Behavior – Gambling Task

In this case study it is proposed the application of the gambling task to a group of individuals in order to identify an entrepreneurial character of responses, which infers a lower perception of risk. This is performed by the acknowledgment of an individual's "hunches" and capacity to reliance on them to bias the corresponding decisions. On this case study is considered the following conjecture:

Hypothesis nº1: *Can Damásio's Gambling Task be applied as a model to measure individual's risk perception?*

It was thus applied Damásio's Gambling Task to a group of participants, where 100€ of play money was given to each one of them. The subjects were told they must take one card at a time from any of the four decks available and that in each play they would receive a certain added amount of money, no money at all, or suffer a punishment, according to the deck chosen, as exemplified in Table 3.1 and thoroughly exhibited in Appendix II.

Nineteen participants were brought to contribute to the task proposed. The participants were designated and selected in arrears to their professional profile by working among micro, small and medium businesses. Some participants are founders and managers, others are collaborators and employees who wholly kindly offered their availability to contribute to the current information assembly. The selection was executed in order to have different kinds of responsibilities among professionals from SMEs, as well as to attain different kinds of entrepreneurial characters and different risk perception profiles.

The information regarding participants will not be openly exposed in order to pledge the privacy and confidentiality from their contribution. Therefore they will be referred as "P", followed by a number from 1 to 19. Moreover, the participants were organized in two groups: Managers and Collaborators, as exposed on Figure 4.1. From the first group it is expected that the responsibility linked with their job may attain a solid entrepreneurial character, as well as a lower risk perception then the second group. The first group encloses 10 managers from SMEs, start-up enterprises

and start-up incubators, while the second group encloses 9 collaborators from the same natures of business.

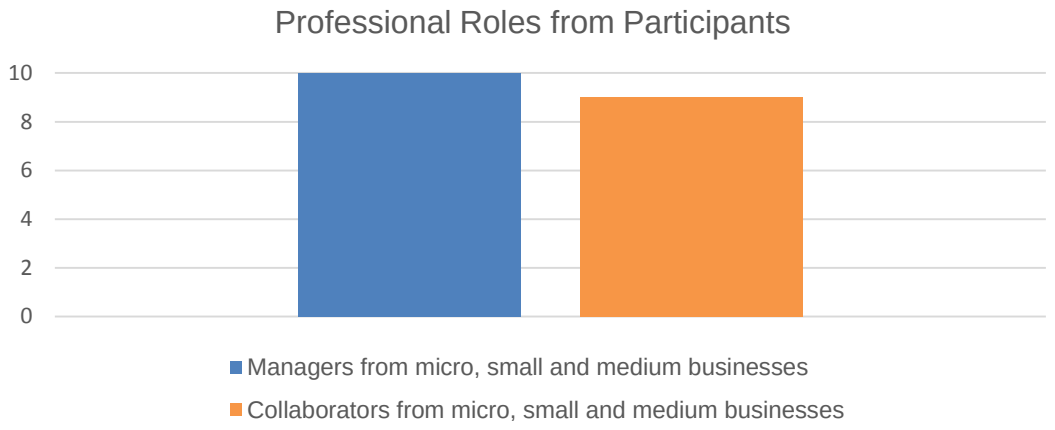


Figure 4.1 Division of roles within micro, small and medium businesses from participants.

The number of choices that each participant performed from each deck were reckoned and registered on the table below. The table is organized by participant and corresponding number of choices per deck, as well as total number of plays until the final decision was reached.

The participants from the first group, which encloses mostly top managers from SMEs, is highlighted in blue and cringes from P01 to P10, while the second group with collaborators from SMEs is highlighted in orange and recoils tags from P11 to P19, demonstrated on Table 4.2.

Table 4.2 Number of cards chosen from each of the decks A, B, C and D until each of the participants reached a decision.

Deck	P 01	P 02	P 03	P 04	P 05	P 06	P 07	P 08	P 09	P 10	P 11	P 12	P 13	P 14	P 15	P 16	P 17	P 18	P 19
A	6	10	9	7	4	9	6	4	6	9	8	10	5	7	10	5	6	6	8
B	8	8	7	10	7	4	10	6	7	10	4	10	6	8	6	4	4	5	5
C	6	9	4	7	5	8	4	5	6	5	6	4	6	6	5	7	9	4	10
D	6	6	6	8	6	9	8	4	6	9	10	6	9	10	5	8	8	5	6
Total	**26**	**33**	**26**	**32**	**22**	**30**	**28**	**19**	**25**	**33**	**28**	**30**	**26**	**31**	**26**	**24**	**27**	**20**	**29**

On the Table 4.3 and Figure 4.2 are represented the same data as on the table above but organized on an ascending order concerning the total number of plays until each individual performs a decision.

Table 4.3 Number of cards chosen from each of the decks A, B, C and D until each of the participants reached a decision, sorted by the total number of plays from lower to higher.

Deck	P 08	P 18	P 05	P 16	P 09	P 01	P 03	P 13	P 15	P 17	P 07	P 11	P 19	P 06	P 14	P 12	P 04	P 02	P 10
A	4	6	4	5	6	6	9	5	10	6	6	8	8	9	7	10	7	10	9
B	6	5	7	4	7	8	7	6	6	4	10	4	5	4	8	10	10	8	10
C	5	4	5	7	6	6	4	6	5	9	4	6	10	8	6	4	7	9	5
D	4	5	6	8	6	6	6	9	5	8	8	10	6	9	10	6	8	6	9
Total	**19**	**20**	**22**	**24**	**25**	**26**	**26**	**26**	**26**	**27**	**28**	**28**	**29**	**30**	**31**	**30**	**32**	**33**	**33**

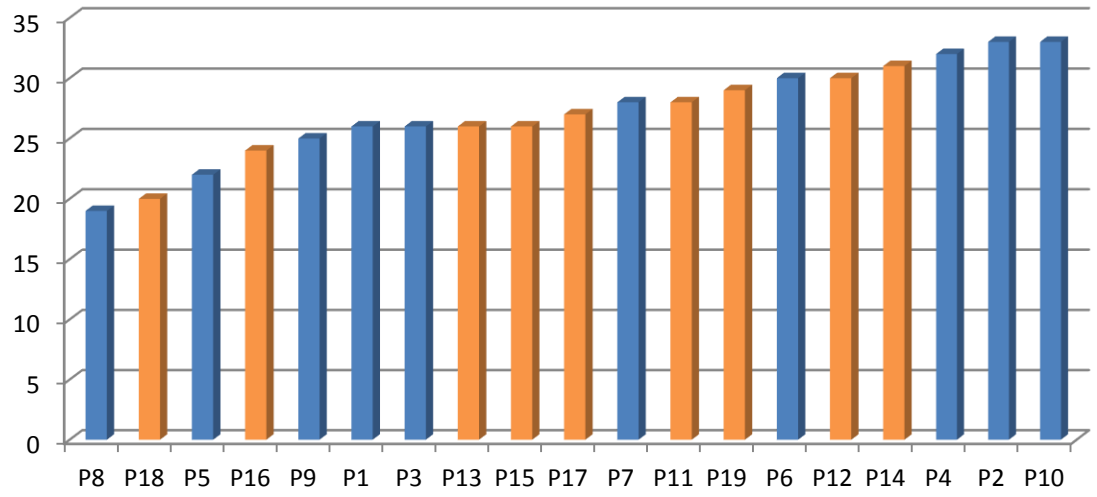


Figure 4.2 Total number of plays until a decision-making, from lower to higher.

The goal of this task was to identify different entrepreneurial character of responses among two different groups of individuals in order to linearly partake different perceptions of risk. Although, as the chart above points out, there is an instant understanding that this distinction is not comprehensible with the sample attained, since the number of plays accomplished seems fully arbitrary by the role embraced by participant.

Consequently it is reasonable to say that, with the sample attained, the hypothesis nº1, concerning Damásio's Gambling Task application as a model to measure individual's risk perception, is seemingly rejected.

4.2 Rectification and Improvement in Spotrisk®

Considering the development of the Project of Spotrisk® in WS-Energia with the purpose to rectify, validate and improve the tool's applicability, several tasks were carried out. In the present segment it is intended to display the aspects from the designated tool that led to such tasks, labeling corrections and showing the final outlooks of the platform. Figure 4.3 illustrates the partition over the changes performed on the designated tool and enlightened over the following chapters.

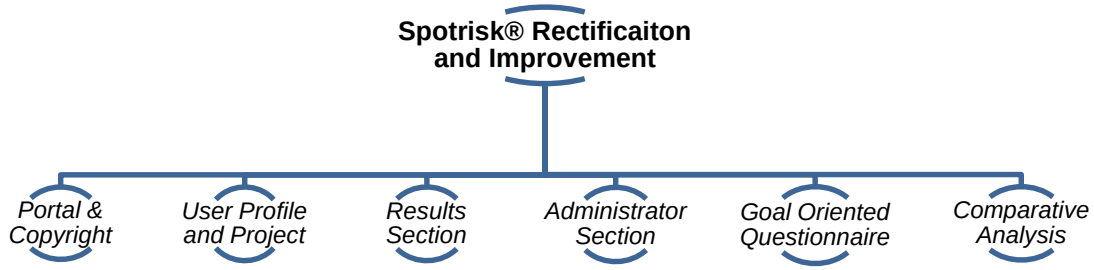


Figure 4.3 Detachment of the changes performed over Spotrisk®.

4.2.1 Spotrisk® Portal and Copyright

The application is hosted in a cloud portal, to which any user can have access throughout registration and login. The portal was developed with the contribution of *INOV – inesc inovação* – and was shaped under *Java* programming, deployed with *Apache Tomcat* and managed with *MySQL*. Therefore the minimum technical requirements to hold the portal are:

- Web Apache Tomcat server, version 7.0.22;
- MySQL version 5.5;
- Java version 1.5;

The users can access the portal, technically described as GUI (Graphical User Interface), using general browsers such as Internet Explorer, Google Chrome or Mozilla Firefox, interacting dynamically with the application. Subsequently, the GUI, which can be handled through Apache Tomcat or a similar tool, interacts dynamically with the database, which can be managed with MySQL or similar tools. The Figure 4.4 shows a simplified diagram representing the application's information flow, showing how the users can interact with the platform and how the answers given are transformed into usable data for the risk assessment of a project.

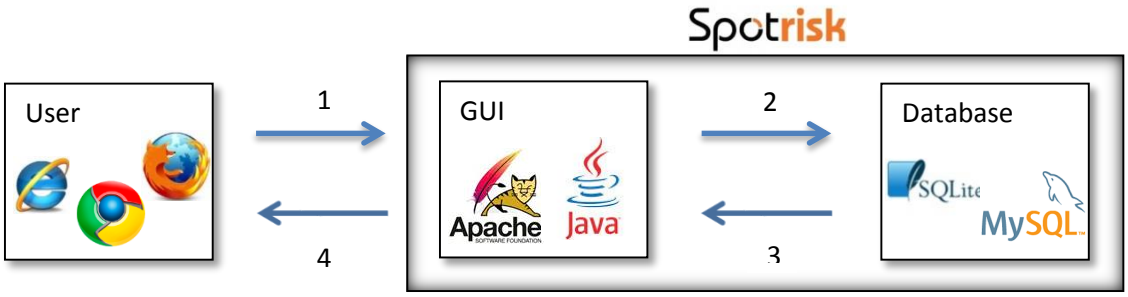


Figure 4.4 Spotrisk's information flow.

Fundamentally, the information flow presented in Figure 4.4 is divided in the following components:

1) The user answers each goal oriented question on a scale from Very Low to Very High, within the three different parameters;
2) The platform uses internal algorithms and sends the information to the database;
3) The platform retrieves the information from the database, under the form of results;
4) The platform shows the data received, on a clean and user-friendly approach.

As mentioned before, Spotrisk's project is internally connoted as NPT and hence the platform was firstly hosted online and available in www.ws-ernergia.com/NPT-WSPortal/. However one of the technical flaws detected was a systematic latency during specific periods of time. Thus one of the adjustments carried out was the modification of the hosting to http://spotrisk.ws/. Any user can access to its content by prior registration and login in the platform, exemplified in Figure 4.5 and Figure 4.6.

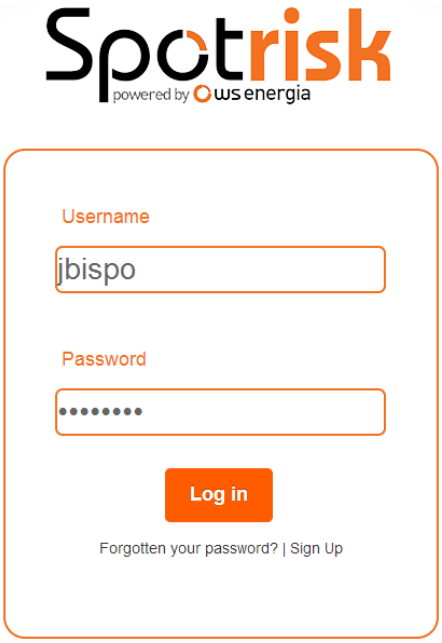


Figure 4.5 Spotrisk login.

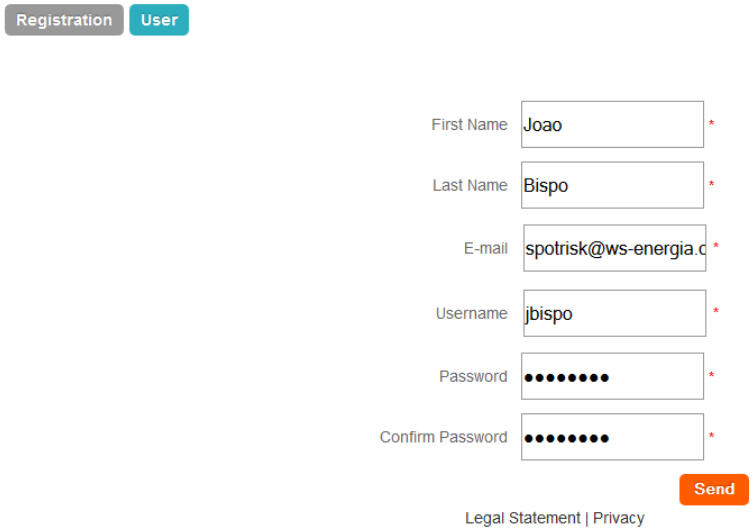


Figure 4.6 Spotrisk registration.

In addition, the designation “Spotrisk” was not originally considered. Consequently, the processes of creating the name, crafting the logo and patenting the trade mark were carried out within the scope of this work, during the support development and validation stages. The trade mark was performed both nationally (via INPI’s platform) and communally under the European Union’s jurisdiction. The corresponding documentation can be found on Appendix V and Appendix VI.

4.2.2 User Profile and Project Sections

After having performed the registration and session login, the user faces the initial page which contains the available projects and user’s profile links, as well as the language and logout options observed in the Figure 4.7.

Figure 4.7 User’s project section before changes.

The initial approach of the platform's development was carried out written in the Portuguese language and thus linguistic enhancements had to be performed accordingly. Also, it was supposedly displayed a green text box above the page throughout the several sections of the platform in order to attend the users as guideline instructions for the different processes which, however, in this point of the platform's development, was not performed and thus the guideline text was provisionally defined as "info text". Thus, conception of guidelines had to be implemented, along with new logo and image's updates, presented on Figure 4.8.

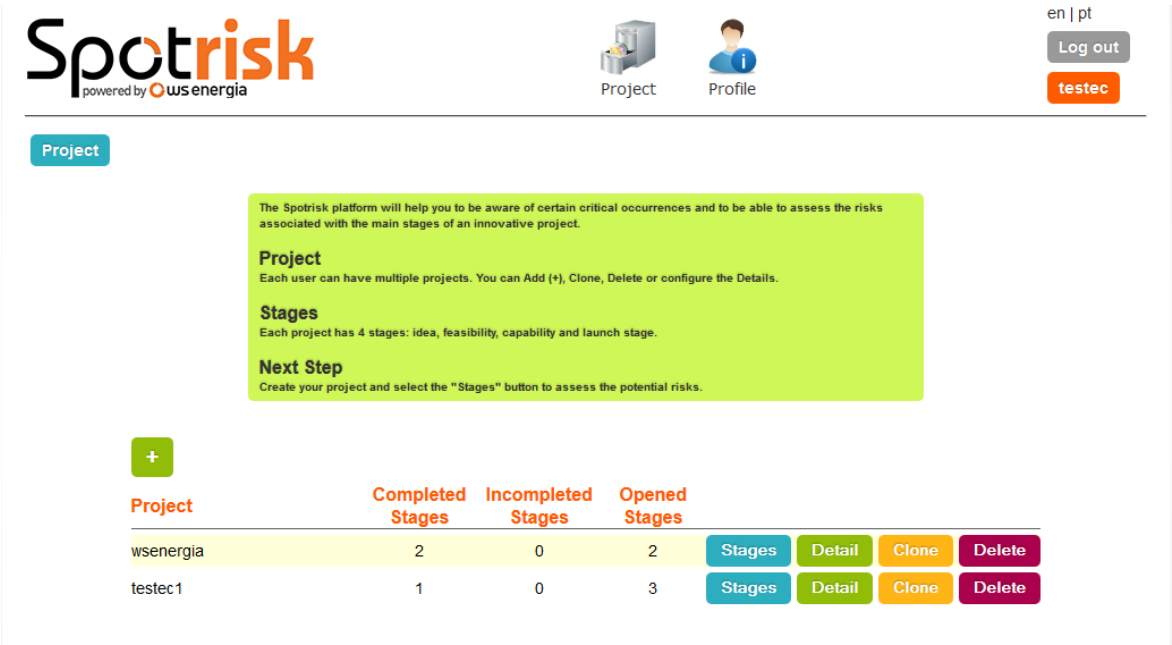


Figure 4.8 User's project section after rectification and improvement.

On the upper part of the web platform, in the "Profile" section, the user can visualize or modify his/her personal data within the platform such as name, surname or password. Whereas, in the "Project" section it is possible to create, edit and delete projects from the user's project portfolio, as well as to access to each project and observe detailed information regarding the different project's stages. The different functionalities of this section are following displayed on Figure 4.5.

Table 4.4 Project's section and different functionalities

[+]	• *Create a new project, by clicking on the (+) button of the upper left side of the project list.*
[Detail]	• *Edit a project, by clicking on the "Detail" button, on the corresponding project line.*
[Delete]	• *Delete a project, by clicking on the "Delete" button, on the corresponding project line.*
[Stages]	• *Project phases, by clicking on the "Stages" button, on the corresponding project line.*
[Clone]	• *This functionality was thought of and created also during the course of this work, due to project portfolio and project risk evolution analysis purposes*.

In the same screen it is also possible to visualize the state of the stages from each project, regarding the number of goals assessed by the user, exemplifies on Figure 4.5.

Table 4.5 Status from assessed stages from within each project

[Completed Stages]	• *Number of stages totally answered by the respondent, which it permits an available risk analysis.*
[Incomplete Stages]	• *Number of stages partially answered by the respondent, disallowing a risk analysis*.
[Opened Stages]	• *Number of open stages, not answered by the respondents*.

In the "Stages" section, represented on Figure 4.9, it is possible to visualize the existing stages of each project, to exclude the answers from a specific stage, to answer or modify the responses and also to access the risk analysis results from each stage, in case the questionnaire was completely answered.

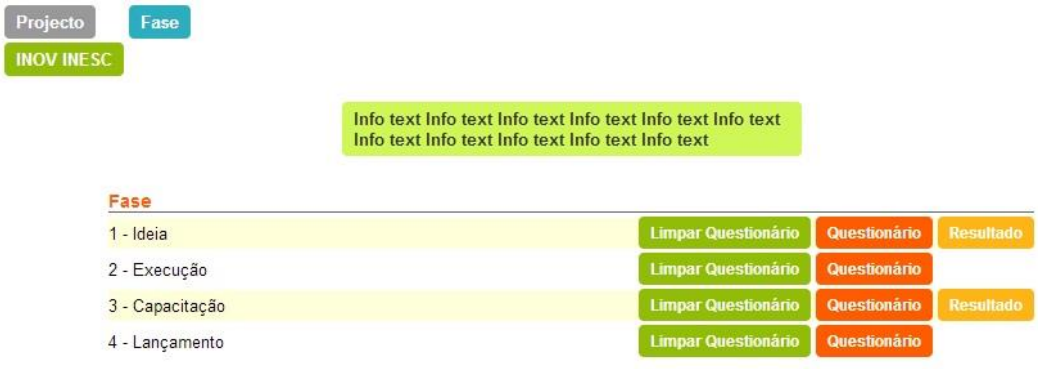


Figure 4.9 Stages section, before considered improvements.

Again, the modifications regarding the language and guidelines were endeavored, along with an additional modification concerning the navigation bar, represented on the Figure 4.10

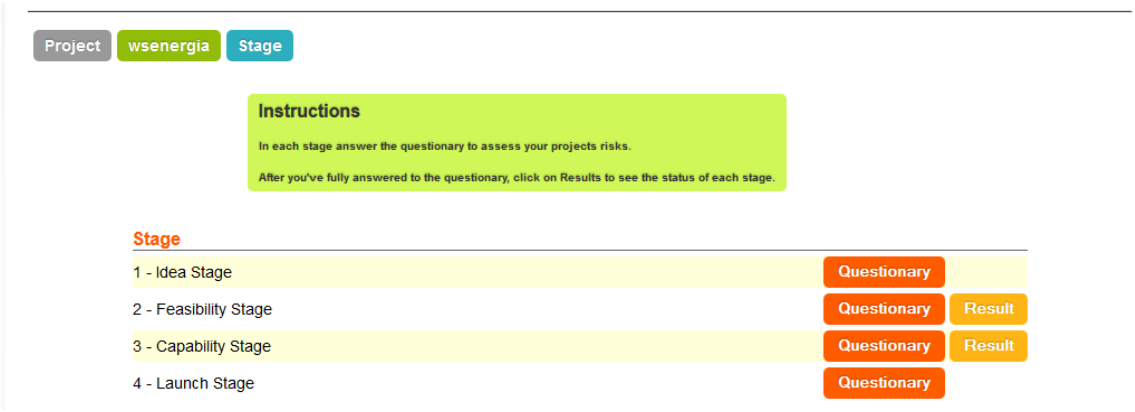


Figure 4.10 Stages section, after rectifications.

Likewise, the buttons prevailing on Figure 4.10 attended the following functionalities, displayed on Table 4.6.

Table 4.6 Functionalities from buttons prevailing on stage section.

[Clear Questionnaire]	• *Excludes the answers given in the corresponding stage from a specific questionnaire.*
[Questionnaire]	• *Proceeds to the corresponding questions from the respective stage, in order to assess, re-assess or just verify the answers given. When the respective goals are totally responded it is then possible to access the results generated from each stage.*
[Results]	• *Proceeds to the results generated by the platform. This button only appears when the answers from the corresponding stage are totally responded..*

4.2.3 Results Section

By clicking on the “Results” button the user accesses the results section, which shows the risk analysis performed during the application. The results section was initially divided into 3 grids, as observed in the 4.11.

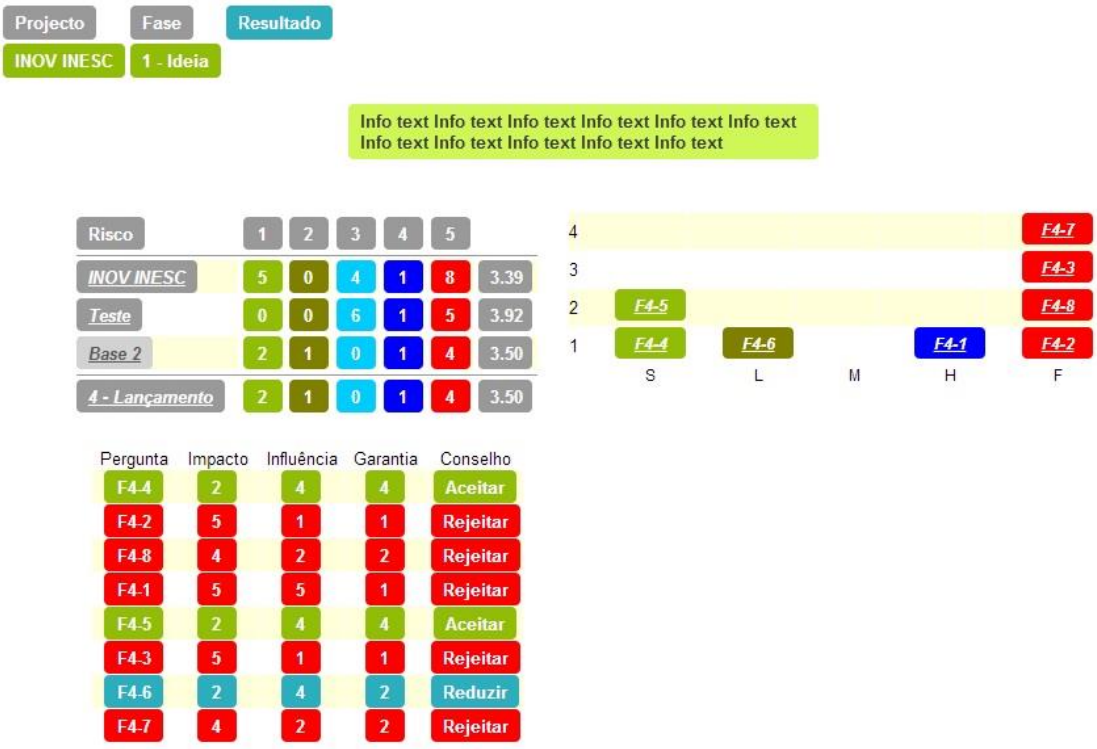


Figure 4.11 Results section before improvements have incurred.

The upper left grid displayed the user's projects, the number of goals equivalent to its risk level, as well as the respective overall risk level. The left table below represented the responses given per selected project or stage, as well as the advices generated. On the upper right table, each goal was distributed by its assessment in terms of risk. This approach was visually demanding, instigating undergone changes that can be observed on Figure 4.12.

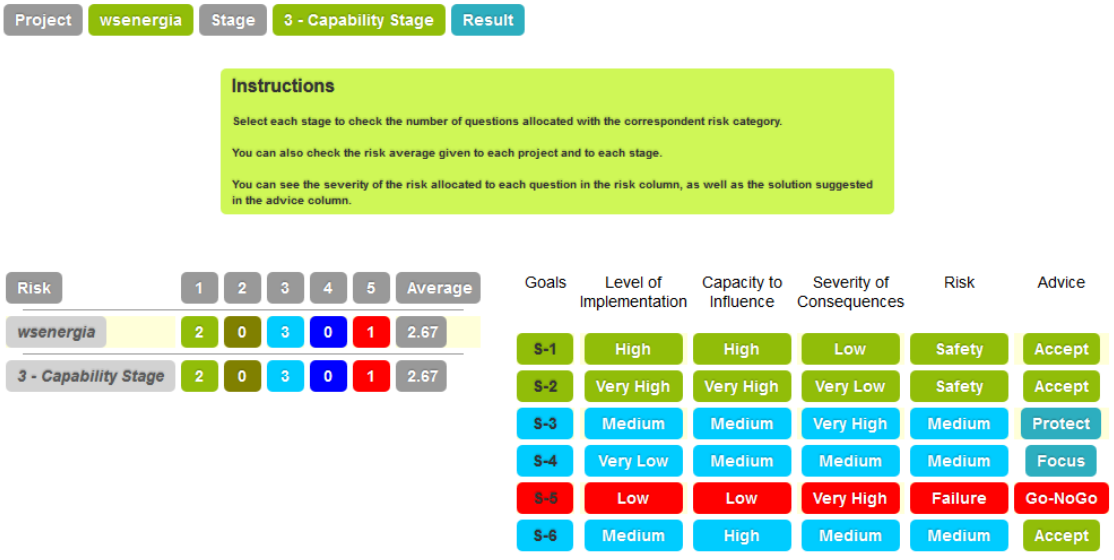


Figure 4.12 Results section after rectifications.

On this modified approach the results section were reduced to two tables, where the left table represent the responses per project and per stage. The user is able to click on each of his/her projects, performing a cascade of the stages assessed, being able to observe which stages were fully responded and its discrete results. Whereas on the right table each response is discriminated regarding each parameter, each assigned risk and each respective advice.

4.2.4 Administrator Section

Additionally, it is available on the portal a specific feature contemplating the administrator's usage. Under an adequate login, a third icon "Admin" appears above the top bar of the platform's screen, where it's possible to manage the administrative functionalities that run the platform, throughout modules such as risk matrix, risk classes, risk factor, projects, users or data exportation, displayed on Figure 4.13.

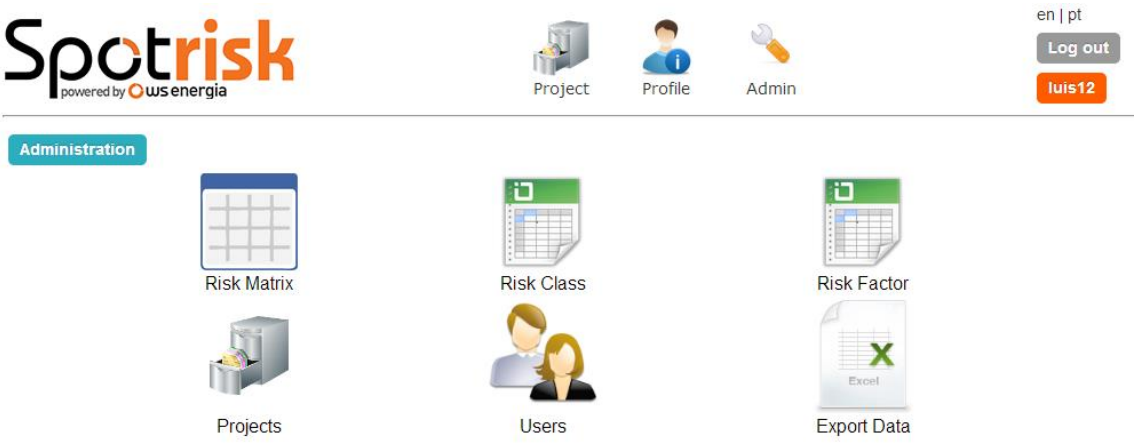


Figure 4.13 Modules available on Administrator Section

a) Risk Matrix

In the risk matrix module are managed the relationships between the three dimensions, or parameters, existing in each goal from the goal oriented questionnaire. In other words, after the user inputs his/her answer regarding one goal the input is converted into a simple code (risk factor). Thus, because each goal assessment comprehends the evaluations of three parameters, or dimensions, its combinations generates different classes of risk according to the nature of the answers given by the user. Hence, the risk matrix (Figure 4.14) is responsible for establishing all the possible combinations between the parameters and relates them with a specific risk factor.

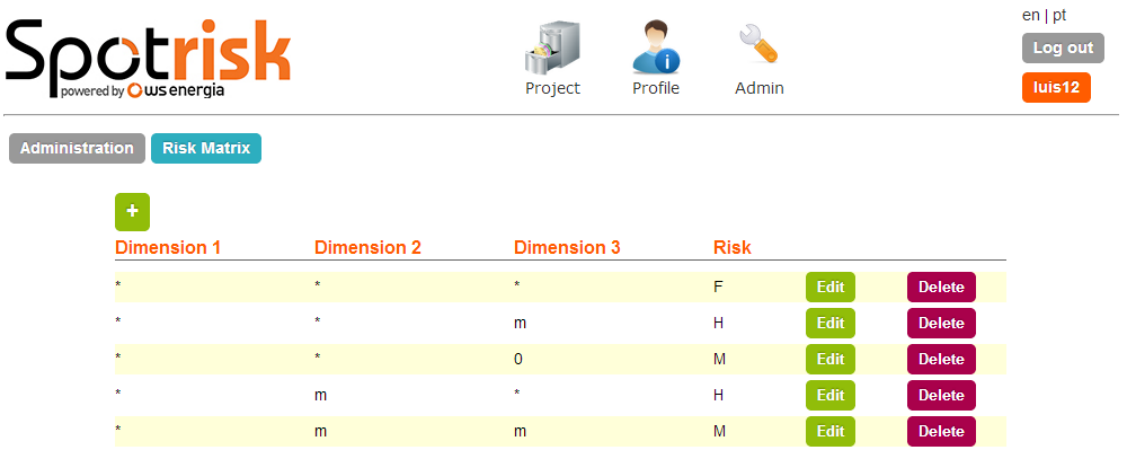


Figure 4.14 Risk matrix.

The image shows five created combinations and generation of risk factors. E.g. in the first row it is represented a project's worst case scenario, where each parameter was assessed as "*", which represents the riskier situation and where its combination generated the risk factor "F", abbreviation from failure. Furthermore, a new combination can be created by clicking on the green (+) button on the upper left side of the screen and, In order to edit or delete a relation, it is simply required to click on "Edit" or "Delete" respectively, on the corresponding row.

This is a crucial module, for it employs the basis of the methodology adopted. As exposed before, The RDM framework uses four different risk factors: "*"; "0"; "m" and "?"; in which "?" is used for the cases when there is a lack of consensus among the interviews. In the specific case of the platform's methodology, this last risk factor is not used, for the assessment is made individually and thus there is no lack of consensus. Therefore, while in RDM's framework exist 64 different possible combinations (4 x 4 x 4), in Spotrisk's application only 27 combinations are conceivable (3 x 3 x 3).

b) Risk Factor Modules & Risk Class

The changes performed in risk class and risk factor modules will directly affect the risk matrix, meaning that each of these modules specifies the connotation of the platform's inputs or outputs, which are then connected in the risk matrix. Specifically, in the Risk factor module the administrator can stipulate the connotation or description in which each answer will be inputted into the database. In other words, the administrator can define the codes attributed to each type of answer given by the user, so that they can be processed inside the database, displayed on the Figure 4.15.

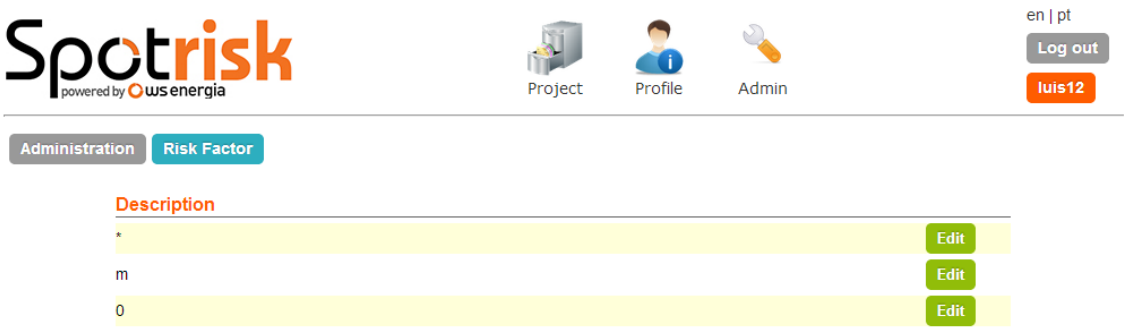


Figure 4.15 Risk factor module

In addition, the combination of risk factors generates a particular risk class. The specific combinations are defined in the risk matrix. However, the connotation of risk classes is defined on the Risk Class module. Which means that in this module are defined the labels with which the results are presented to the user, shown on Figure 4.16.

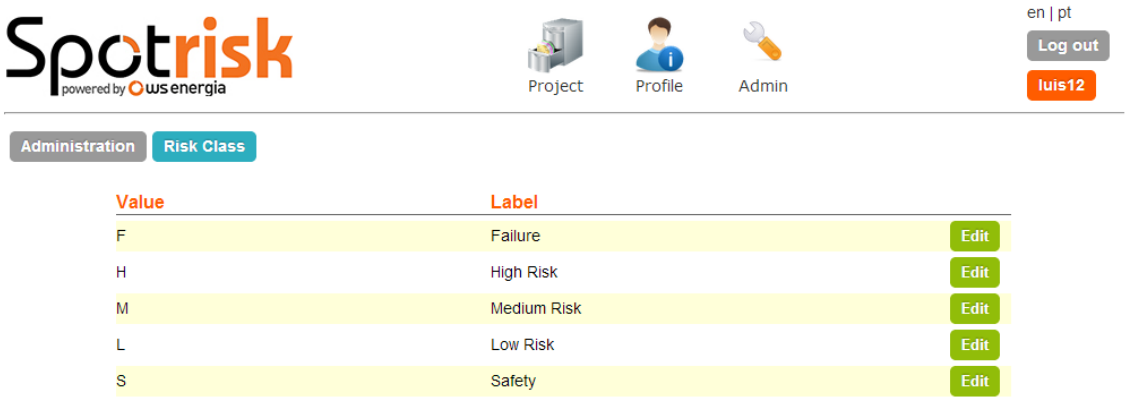


Figure 4.16 Risk class module

Furthermore, in the remaining modules - projects, users and export data - it is possible for the administrator to visualize and manage the existing projects and user's interaction within the platform, as well as to export the data into excel sheets. Such modules are available and can be observed in Appendix VII.

In order to attain an enhanced understanding regarding the utilities and functionalities of the platform it was developed an overall portal's map, available on the Figure 4.17:

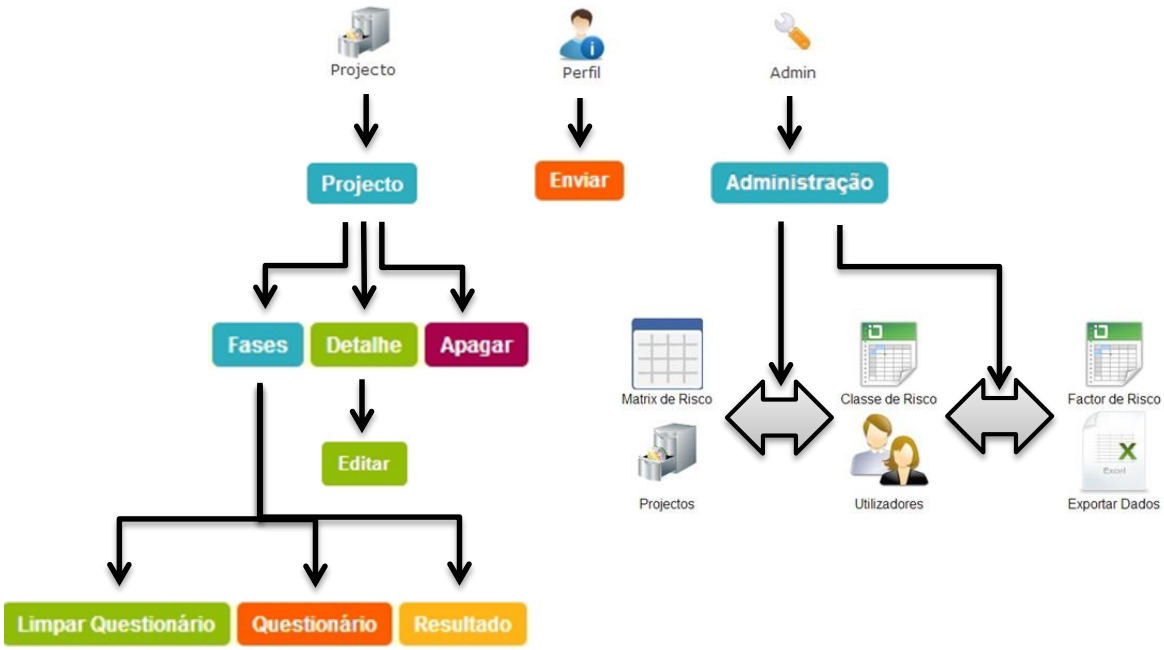


Figure 4.17 Map of Spotrisk's web base application.

4.2.5 Goal Oriented Questionnaire and its Inferences

Each question, now rendered into a goal/objective, was generated in order to be responded individually by project team members who have a near interaction and actual knowledge about the assessed project and its conditions. Each one of the 35 goals, available on Appendix III, was then presented and demanded an evaluation standing on three different parameters described on Table 4.7.

Table 4.7 Parameters considered per each assessed goal.

Level of Implementation	*Represents the user's confidence regarding his notion of resemblance between the specified goal and the project's reality; i.e. the strength of the statement's truth, within the project's representativeness.*
Capacity to Influence	*Represents the ability of the project team to control the course of action, within the time and resource limits.*
Severity of the Consequences	*Represents the potential significance and impact of the specified goal over the project's success.*

In this goal oriented questionnaire it is obviously important for the veracity of the results that the amount of knowledge and information of the respondent regarding his/her project is vast, being this a crucial requirement and an assumption in order to perform the project risk assessment.

For each parameter considered it is given an answer according to a Likert five-point-scale from 1 to 5, in which for the first two parameters, Level of implementation and Capacity to Influence, the value “1” represents the lowest deliberation and “5” represents the highest deliberation. Whereas, for the third parameter, Importance, the value “1” represents the highest deliberation and “5” represents the lowest deliberation.

This antagonism is due to the fact that the third parameter works with an inverse purpose: while the Level of implementation and Capacity to Influence parameters have higher deliberations, greater are the considerations regarding the safety conditions of the project and subsequently the lower is the risk of the same project, since these parameters represent positive traits within a project. In contrast, regarding the Severity of the Consequences parameter, the higher its deliberation is, the more delicate are the safety conditions of the project and subsequently the higher is the risk of the same project, being that this parameter emphasizes the fragility of the project, uncovering a potential negative impact on the project’s performance by not attending to the specified goal, which is represented on the Table 4.8

.

Table 4.8 Functional antagonisms concerning the existing parameters.

	Level of implementation	**Capacity to Influence**	**Severity of the Consequences**	
Jeopardizes project	1	1	5	*Jeopardizes project*
	2	2	4	
	3	3	3	
	4	4	2	
Benefits project	5	5	1	*Benefits project*

In addition, the platform generates general advices according to each specific goal, so that the user is able to manage each issue convoyed with an outline guidance regarding the course of action. The existing advices are: *Accept, Focus, Acquire, Protect* and *Go/No-Go.*

Focus advice expresses a lack of resemblance between the specific goal and the project’s representativeness, requiring thus an allocation of resources and additional efforts regarding a particular goal. *Acquire* advice results in a lack of ability from the project team to control the course of action, being necessary to obtain particular information or to enhance communication regarding a particular goal. *Protect* advice expresses a too significant impact of the specified goal over the project’s success, being thus desirable to modify contract’s typology or to acquire insurances. *Accept* and *Go/No-Go* result respectively either on a faultless state of project’s goal or on an awfully risky endeavor and where a decision must be performed regarding a specific goal.

The platform’s rules of generating specific advices are shown on the following table, being that *Accept* advice is due if each of the parameters is assessed with a rating higher than 2 (from 1 to 5). In contrast, *Go/No-Go* advice is generated if each of the parameters is assessed with a rating

equal or below 2. The remaining advices *Focus*, *Acquire* and *Protect* are due when Level of Implementation is equal or below the rating of 2 and Capacity to Influence and Severity of the Consequences are above 2. For a wider understanding, Table 4.9 illustrates the platform's rules of generating advices.

Table 4.9 Advices generated by Spotrisk and corresponding rules.

	Accept	***Focus***	***Acquire***	***Protect***	***Go/No-Go***
Level of Implementation	**> 2**	**≤ 2**	**> 2**	**> 2**	**≤ 2**
Capacity to Influence	**> 2**	**> 2**	**≤ 2**	**> 2**	**≤ 2**
Severity of the consequences	**> 2**	**> 2**	**> 2**	**≤ 2**	**≤ 2**

In addition, a Score Matrix to express the relations between parameters and advices generated by its combinations is represented in the following charts represented on Figures 4.18, 4.19 and 4.20.

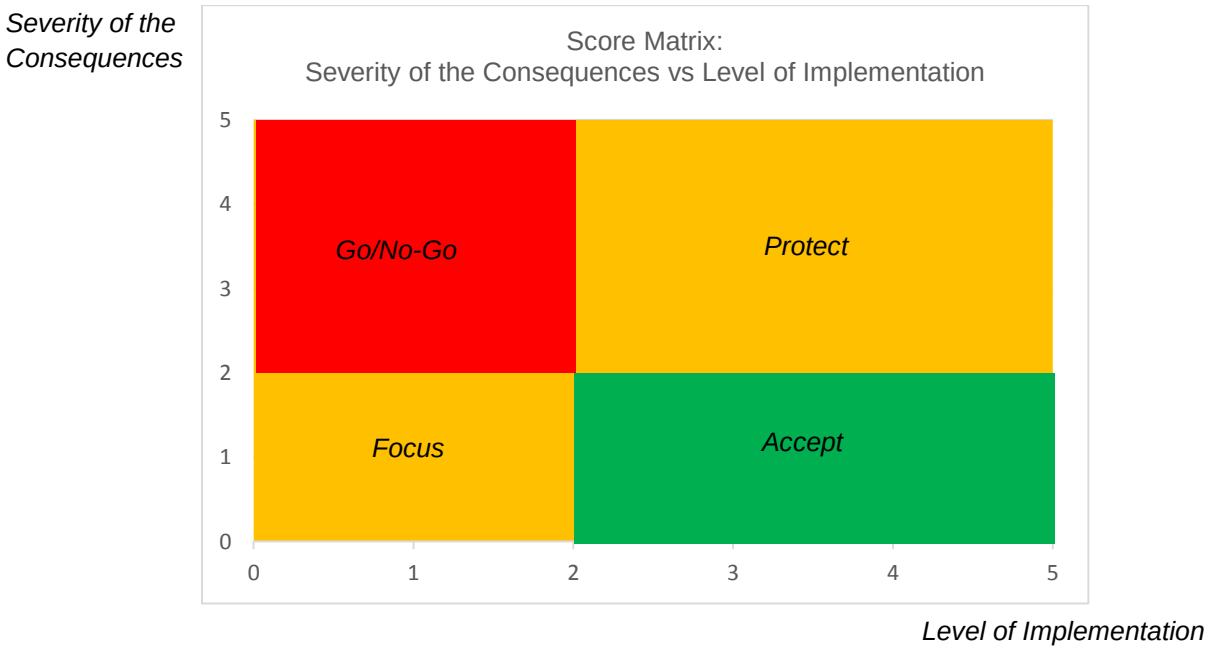


Figure 4.18 Advices generated according to the relation between *Severity of the Consequences* and *Level of Implementation.*

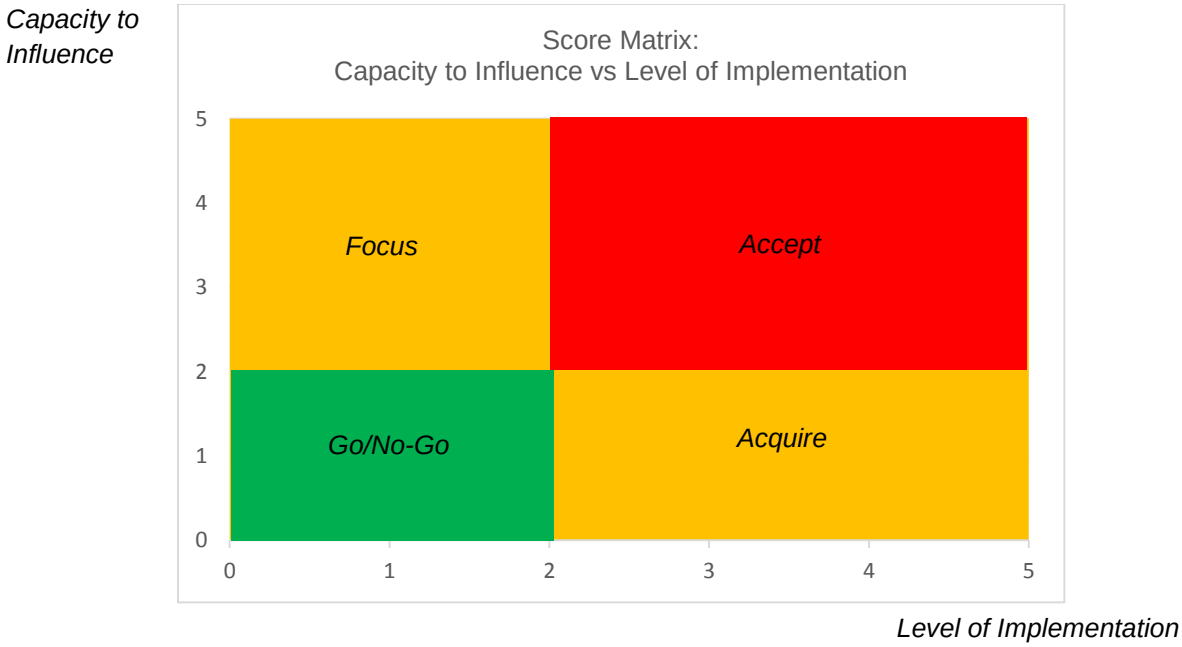


Figure 4.19 Advices generated according to the relation between *Capacity to Influence* and *Level of Implementation*.

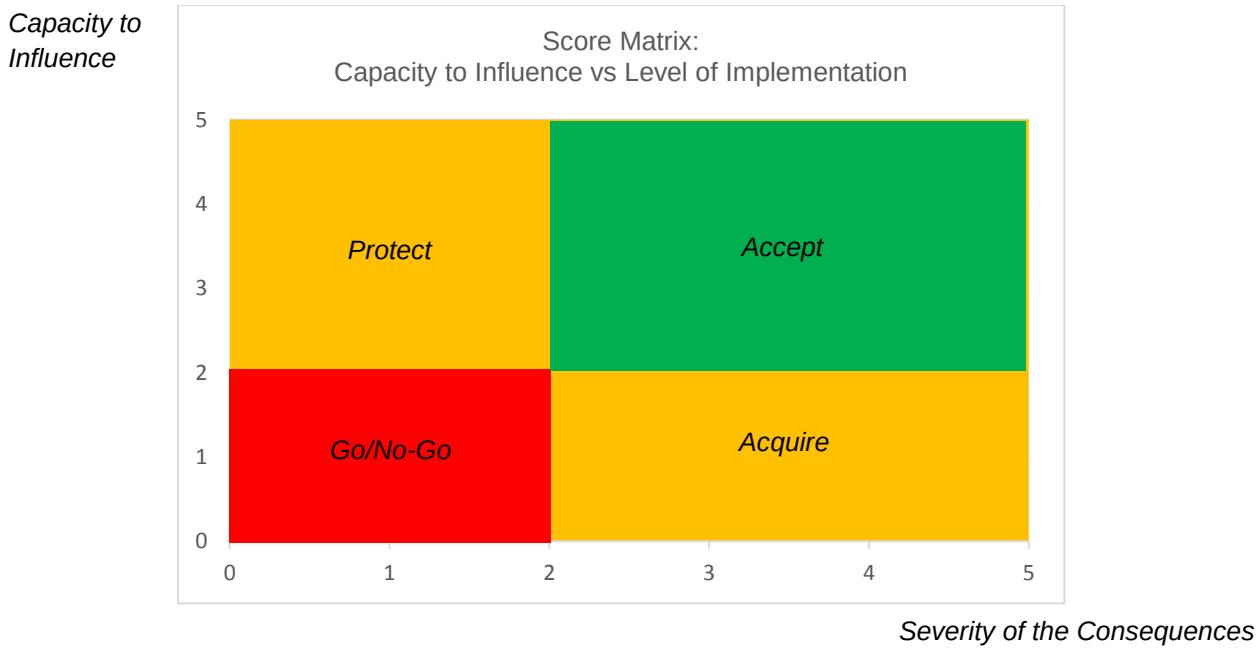


Figure 4.20 Advices generated according to the relation between *Capacity to Influence* and *Severity of the Consequences*.

4.2.6 Comparative Analysis

During the final developments of Spotrisk®, it was advanced the possibility for the users to obtain feedback from a global network of other users' projects within the platform, aggregating and biding the information collected. Each submitted project is stored on the database, contributing for the data collection from which every user can compare his/her project. Each project can then be matched in terms of project's risk ranking, stage risk status or goal risk assessment, with projects from a specific user (or groups of users) or with a specific project. Thereby, it is possible to incrementally enrich an assessed project by submitting it to a global comparison and working as an innovation network. The continuum use of the platform provides further information to the database, working as a bilateral delivery that will bring feedback to platform's administrators regarding incremental improvements, layout suggestions, new specific project advices or other issues. Furthermore, also for comparison purposes, it is possible to provide typical kinds of project assessment profiles, according to the characteristic and distinguishing kinds of answer given in the goal oriented questionnaire, as displayed on the Figure 4.21. In other words, there is a group of different profiles, such as "*Protected*" or "*Out of Hand*", to enclosure any assessed project within the cluster of the available typical classes, in order to have a basis of comparison for assessed projects.

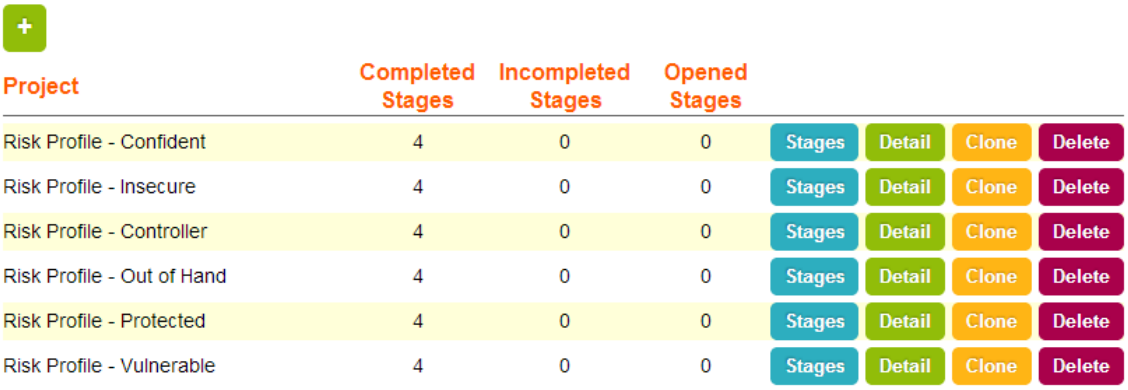


Figure 4.21 Typical classes of assessed projects available.

Henceforth, there are available several antagonist relations between different types of assessment profile. For instance it is possible to provide profiles of antagonist relations concerning types of answers given by each goal, such as "Confident vs Insecure", where "Level of Implementation" is the weighting link between assessments, leaving "Capacity to Influence" and "Severity of the Consequences" similarly equivalent, noticeable on the Appendix VIII. Other antagonist relations analysis, concerning the types of answers given by each goal can be available, such as "Controller vs Out-Of-Hand" and "Protected vs Vulnerable", in which "Capacity to Influence" and "Severity of the Consequences" are respectively the weighting links, also in Appendix VIII.

4.3 Validation of Spotrisk® Tool - Case Study

The process of validation of Spotrisk® was composed by a series of testing. As illustrated in Figure 4.22, the tool was internally tested at WS Energia, along with their collaborators, followed by an external process of disclosure and testing through a workshop performed in a start-up incubator – *Madam Parque*.

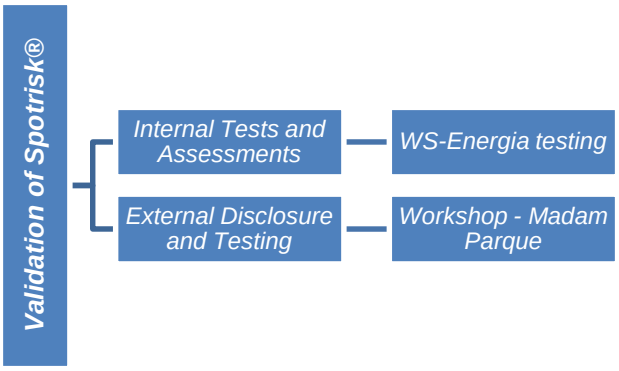


Figure 4.22 Spotrisk® validation.

4.3.1 Internal Tests and Assessments

The first tool test was carried out with six projects within WS-Energia, through an individual evaluation made by each of the six collaborators inserted in the respective project. The evaluated projects, despite pertaining within the same company, were able to reach different areas and components, such as operational, research & development and financial departments, providing a preliminary test regarding the universal content of the goal oriented questionnaire. The testing was made specifically concerning the goal oriented questionnaire intricate issues, where it was attempted to attain an awareness of the understanding that users had from each goal. They had to evaluate each goal regarding its comprehension of it in a likert scale from 1 to 5, according to Table 4.10.

Table 4.10 Evaluating table for internal assessments.

Options	Description
1	*Incomprehensible*
2	*Dubious*
3	*Understandable with some effort*
4	*Comprehensible*
5	*Perfectly comprehensible*

Furthermore it was performed an analysis per goal where was gathered the valuation given by all collaborators, followed by the corresponding average. An example of the first 5 assessed goals by the 6 collaborators is illustrated on table 4.11.

Table 4.11 Comprehension of each of the collaborators concerning the first 5 assessed goals.

	Goal 1	**Goal 2**	**Goal 3**	**Goal 4**	**Goal 5**
Collaborator 1	5	5	5	5	4
Collaborator 2	3	5	4	5	5
Collaborator 3	5	4	4	5	4
Collaborator 4	4	4	4	5	4
Collaborator 5	4	5	3	4	4
Collaborator 6	4	5	5	4	5
Average	**4,2**	**4,7**	**4,2**	**4,7**	**4,3**

The same task was executed for all 35 goals, generating the data available in Appendix IX. From that table it was possible to produce a visually understandable radar chart, represented on Figure 4.23.

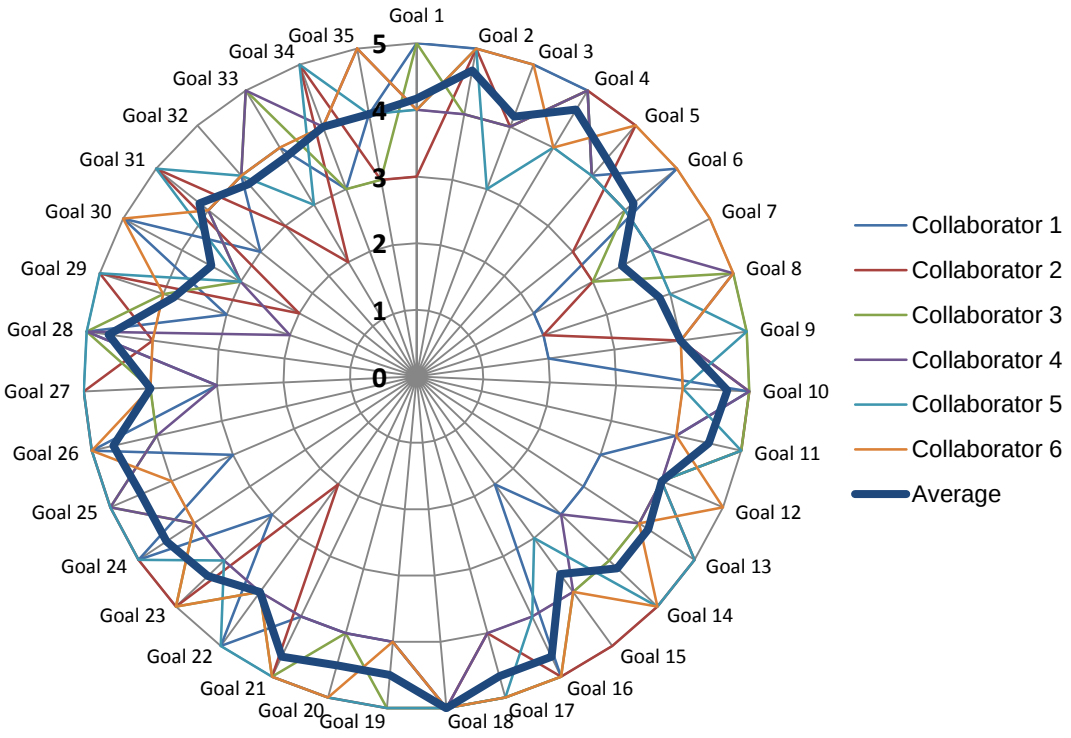


Figure 4.23 Comprehension from each of the collaborators concerning all of the 35 assessed goals.

Besides the qualitative assessment concerning the comprehension attained, each collaborator provided some feedback, suggestions and delivered some questions that arose throughout the process. Expressly, developing such assessments provided them possibility to contemplate risks and situations that they never had previously thought.

Moreover, the first results obtained showed that the purpose of a web integration of a tool could directly and effectively support the use of risk management practices, and that the easy access and little time expenditure involved could be a suitable approach towards SME's.

4.3.2 External Tests – Workshop Madan Parque

Aiming to test the Spotrisk® tool, and check their potential coverage and utility for other organizations outside the energy cluster, a risk management workshop was carried out for start-up enterprises and SME's, in Madam Park, a start-up incubator in Almada, Portugal. This event took place with a total of 14 participants. As exposed in Table 4.12 the participants covered several selected areas such as start-up incubator representatives, SME's managers, risk academic experts and researchers.

Table 4.12 Areas covered by participants in the designated workhop.

Main Domain	Participants
Academic	4
SME's Enterprises	6
Start-up Enterprises	4

The workshop was opened with an initial insertion of what was the main purpose of the work to be done, followed by a brief individual introduction of each of the participants. The corresponding agenda can be seen in Appendix X.

Afterwards a brainstorm session took place, aiming to list the main risks experienced by each of the interveners and respective categorization, where different issues were pointed out, such as human resources, intellectual property, deadlines or market inexperience, which would help later to grasp the tool.

Then a brief presentation from a representative from a Lisbon start-up incubator was carried out, regarding the main difficulties felt in their project on the initial phase. Hereafter, the theoretical components bonded to a conformed risk management process where introduced in order to insight the participants upon the project risk management professional standards and existing models.

Lastly the Spotrisk® tool was presented and each participant used the platform to evaluate a particular project being held or in which they had been inserted in their professional life. Then all the 14 projects were compared and the risk profiles were analyzed, collecting sundry project risk

profile average results. The lowest and highest results were respectively 1.74 and 3.82, which led to a conversation regarding the reasons underneath the values found in each project, where it was concluded for example that the lowest result of 1.74 was in fact due to the nature of project analyzed, holding very safe conditions from several investors and institutions.

In the end a debate took place, where were dealt some appreciations regarding the value that Spotrisk® could bring to SME's and start-up enterprises, as well as some improvements and suggestions on the platform's performance.

During the workshop, each participant received a small survey, available in Appendix XI, to set down some considerations upon the most interesting aspects, as well as suggestions and ideas regarding the improvement of the presented tool. They were also asked to fill a small evaluation table, in order to assess a few specific aspects. Table 4.13 presents summarized the main assessment values obtained from the 14 participants, where they evaluated platform's aspects such as "Usability", "Comprehension", "Appearance"; "Potential Utility" and "Overall Appreciation", with a likert scale from 1 (very bad) to 5 (excellent).

Table 4.13 Results obtained from the 14 participants, concerning the features of Spotrisk®.

	Usability	**Comprehension**	**Appearance**	**Potential Utility**	**Overall**
Participant 1	4	3	3	4	4
Participant 2	3	3	3	4	4
Participant 3	4	4	4	4	4
Participant 4	3	4	3	4	3
Participant 5	4	4	5	4	4
Participant 6	3	3	4	5	4
Participant 7	2	3	3	5	4
Participant 8	4	3	3	4	4
Participant 9	2	4	4	5	4
Participant 10	3	3	4	5	3
Participant 11	4	4	3	5	4
Participant 12	4	4	3	5	4
Participant 13	4	3	4	5	4
Participant 14	4	4	3	5	4
Average	**3,4**	**3,5**	**3,5**	**4,6**	**3,9**

From the gathered results it was then possible to exert the following analysis displayed on Table 4.14 and Figure 4.24.

Table 4.14 Foremost features from the tool's analysis and corresponding values.

Item	Average	Min.	Max.
Usability	3,4	2	4
Comprehension	3,5	3	4
Appearance	3,5	3	5
Potential Utility	4,6	4	5
Overall Appreciation	3,9	3	5

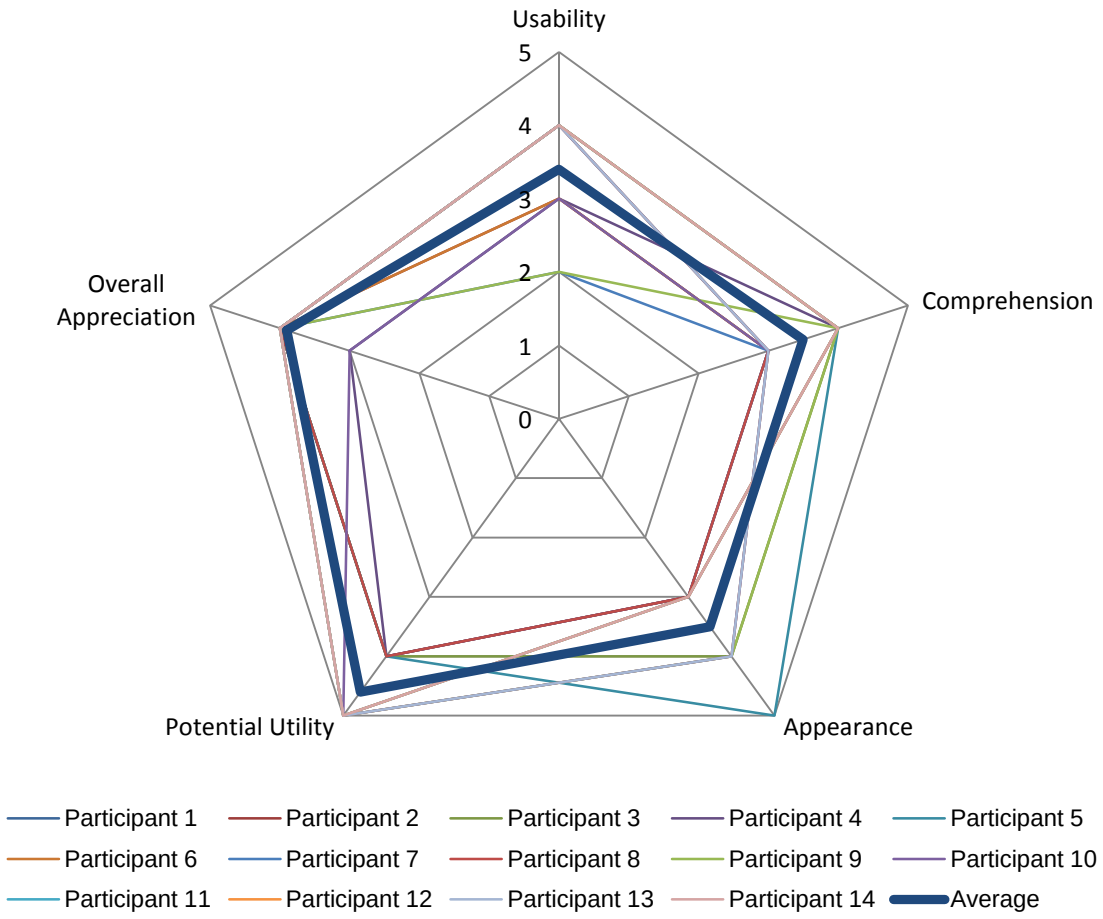


Figure 4.24 Radar chart from the participants' assessments from the tool's aspects.

From the results gathered, the average numbers obtained suggest that the strongest feature of the platform is the potential utility to users, while the aspect which needs more improvement is the usability associated with the navigation in the web-platform. Additional feedback was also brought driven by the awareness given to the participants through the process of answering the goal oriented questionnaire. Appreciations were rendered by participants affirming that the questionnaire provided to them the possibility of contemplating risks and events that they would never have directly thought before. These appreciations suggest that the simple action of

answering to the questionnaire *per se* provides the user an important awareness of some critical risks inherent to a project. Therefore, as it was also inputted through the contribution of the segment of start-up incubators, that this risk assessment tool can compose an ideal tool for start-up incubators, for it brings important awareness to individuals who normally were never exposed to the exerted situations.

4.4 *Anchoring Vignettes* – Case Study

With the application of *Anchoring Vignettes* methodology it is expected that a bias correction and standardization is empowered, along with the possibility that users can have a more tangible approach towards the goal oriented questionnaire. It is thus considered the following hypothesis:

Hypothesis 3: *Can Anchoring Vignettes influence a project's self-assessment and reduce biased results?*

With this inference it is expected to verify differences in the answers collected in the goal oriented questionnaire. Hence, to scrutinize this conjecture, a case study composed by four stages was developed, as displayed in Figure 3.10, commenced with an initial self-assessment, followed by the assessment of the presented vignettes together with a replication of the self-assessment, and lastly a response analysis took place.

4.4.1 Case Study – First Self-Assessment

In a first approach it was studied if by *Anchoring Vignettes* it's possible to influence the self-assessment of a project's situation. To do so, an overall analysis was performed, in which the average of each goal was calculated for each participant, exemplified on the Table 4.15 with the first participant's self-assessment and thoroughly displayed on Appendix XIII.

Table 4.15 First self-assessment and corresponding average of results - participant nº1.

Participant nº1	**Level of Implementation**	**Capacity to Influence**	**Severity of the Consequences**	**Average**
S01-G01 Idea Stage	2	4	3	3
S03-G04 Capability Stage	3	3	3	3
S02-G05 Feasibility Stage	2	2	3	2,3
S01-G09 Idea Stage	2	2	3	2,3
S04-G03 Launch Stage	3	2	2	2,3
			Average	**2,6**

Similarly, the same approach was performed for the remaining 18 participants, results which can be observed in detail in Appendix XIII. Such results are synthesized on the following chart, displayed on Figure 4.25.

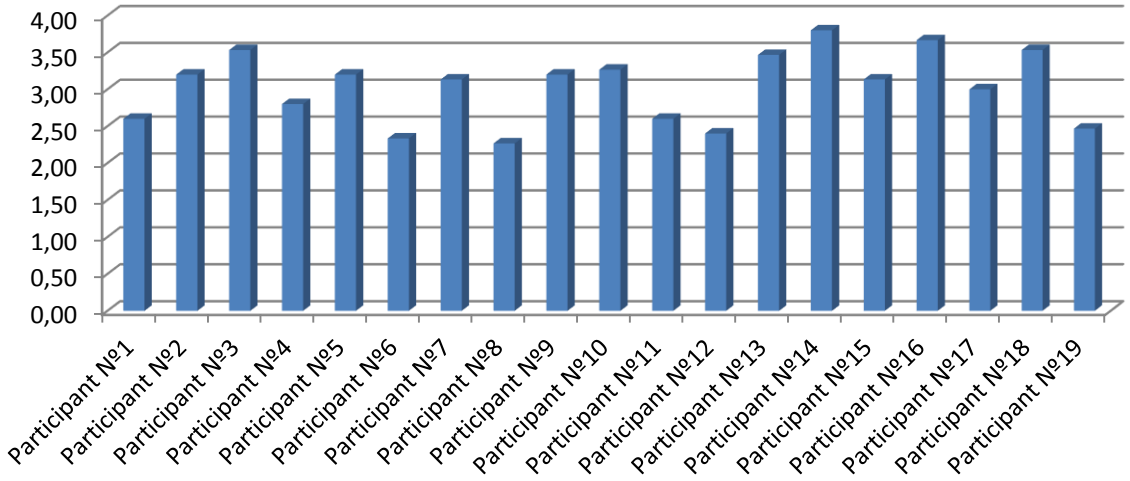


Figure 4.25 Averages from the collected first stage of self-assessments.

4.4.2 Case Study – Vignettes Assessment and Replication of Self-Assessment

The same process was carried out on a second phase of assessments, where this time the participant is asked to evaluate the presented vignettes, immediately followed by a second self-evaluation according to the designated goals. The information collected concerning the first participant is summarized on Table 4.16 and available on Appendix XIII.

Table 4.16 Vignettes' assessment, second self-assessment and corresponding average of results - Participant 1.

Participant Nº1	**Level of Implementation**	**Capacity to Influence**	**Severity of the Consequences**	**Average**
Vignette nº1	3	4	3	3,33
Vignette nº2	2	2	3	2,33
S01-G01 Idea Stage	3	2	5	3,33
Vignette nº17	3	3	5	3,67
Vignette nº18	2	1	3	2,00
S03-G04 Capability Stage	3	4	4	3,67
Vignette nº11	4	2	5	3,67
Vignette nº12	2	1	2	1,67
S02-G05 Feasibility Stage	2	4	5	3,67
Vignette nº5	3	3	2	2,67
Vignette nº6	3	2	1	2,00
S01-G09 Idea Stage	3	3	3	3,00
Vignette nº19	4	5	4	4,33
Vignette nº20	3	4	2	3,00
S04 - G03 Launch Stage	4	3	2	3,00
			Average	3.33

Correspondingly, the same approach was performed for the remaining 18 participants and the respective results can also be observed in Appendix XIII, which can be synthesized on the following chart displayed on Figure 4.26.

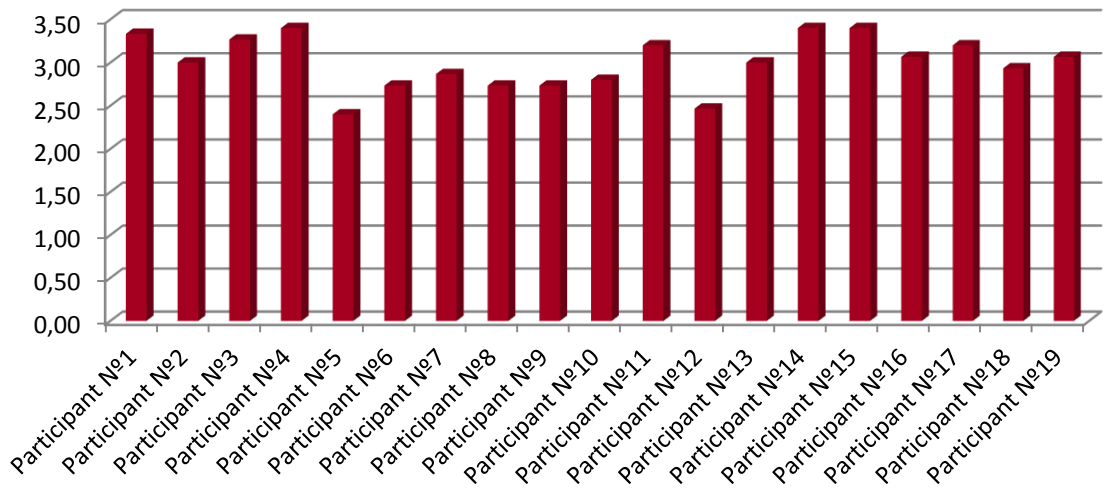


Figure 4.26 Averages from the collected second stage of self-assessments.

The gathered results provided the possibility to perform a comparison between both of self-assessments completed by participants. Furthermore, it was endeavored a comparative analysis with the collected data, available on Figure 4.27.

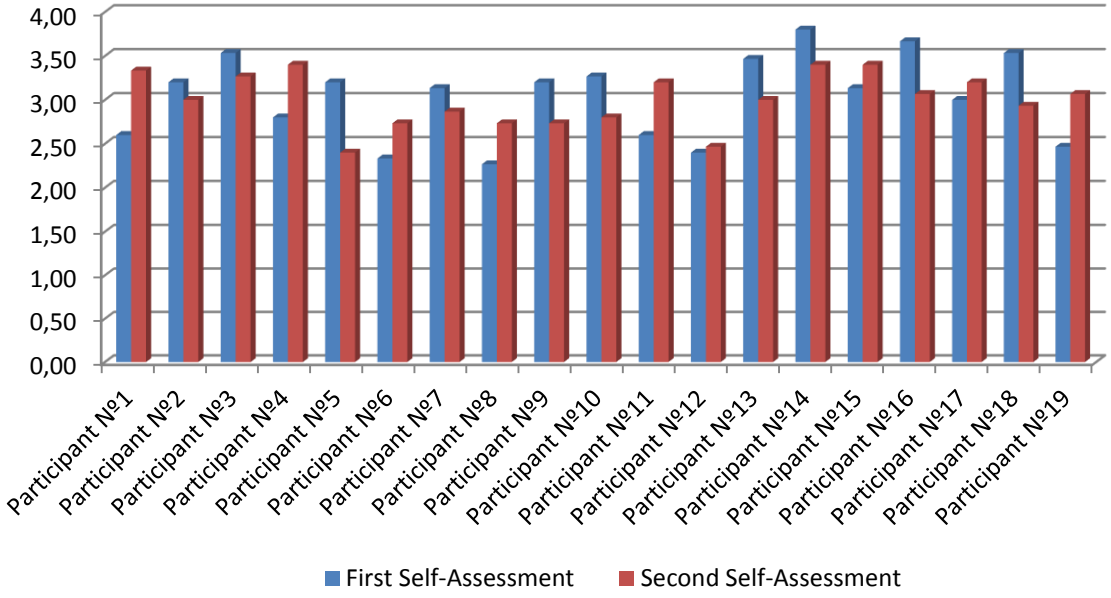


Figure 4.27 Comparison analysis between both of self-assessments.

However this approach by itself may not be solid enough to engross a clear understanding of the differences between assessments with and without interaction with vignettes. Thus it was

developed an analysis aimed at the dispute of whether if any changes in self-assessment occurred, once the vignettes were considered and appraised. To do that, a thorough evaluation across every participant's answers was performed, resulting on the indicator "I/0", which represents whether if the participant changed his/her answer – "1" – or if it was willfully maintained – "0". An excerpt of this analysis is represented on the last column from the Table 4.17, concerning the first participant, while the full analysis can be consulted in Appendix XIII.

Table 4.17 Comparative analysis to study whether if any changes in self-assessments occurred, with the vignettes' consideration.

Participant Nº1	Parameter	Self-Assessment 1	Vignette 1	Vignette 2	Self-Assessment 2	**I/0**
S03-G04	*Level of Implementation*	3	3	2	3	**0**
	Capacity to Influence	3	3	1	4	**1**
	Severity of the Consequences	3	5	3	4	**1**

After analyzing the whole range of answers changed by each participant, it was produced a percentage from the quantity of answers changed. Consistently, the same analysis was performed for the remaining answers, along the lingering participants, and the respective results can be observed in Appendix XIII. Furthermore, the percentage from cases of change and conservancy in answers can also be observed in Appendix XIII, being accordingly synthesized on Figure 4.28.

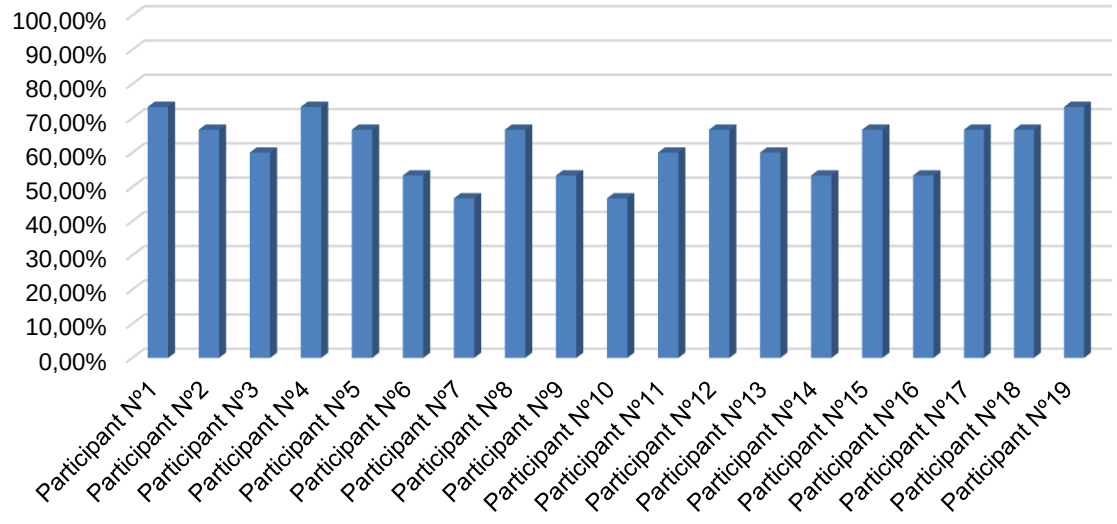


Figure 4.28 Percentage of answers changed per participant.

An alternative analysis can be brought into deliberation, considering the exacting variation in answers verified in both self-assessments. For instance, if a participant rates the level of

implementation of a project as “High” (4) and posteriorly, in an analysis with the vignette’s influence, the same project is rated as “Low” (2), then the absolute value of the variation verified is of 2 units (from 4 to 2). This analysis is illustrated on the Table 4.18, regarding the first participant, in which the last column represents the absolute variation (Abs Var.) verified in both self-assessments, concerning the 5th goal of the feasibility stage.

Table 4.18 Absolute variation verified between both self-assessments.

	Parameter	Self-Assessment 1	Vignette 1	Vignette 2	Self-Assessment 2	Abs Var.
S02-G05	*Level of Implementation*	2	4	2	2	0
	Capacity to Influence	2	2	1	4	2
	Severity of the Consequences	3	5	2	5	2

Likewise, the same analysis was performed for each of the remaining answers and participants, and the respective results can be observed in Appendix XIII. In addition, the average of variation verified in the collection of answers given by each participant can also be observed in Appendix XIII, being consistently summarized on Figure 4.29.

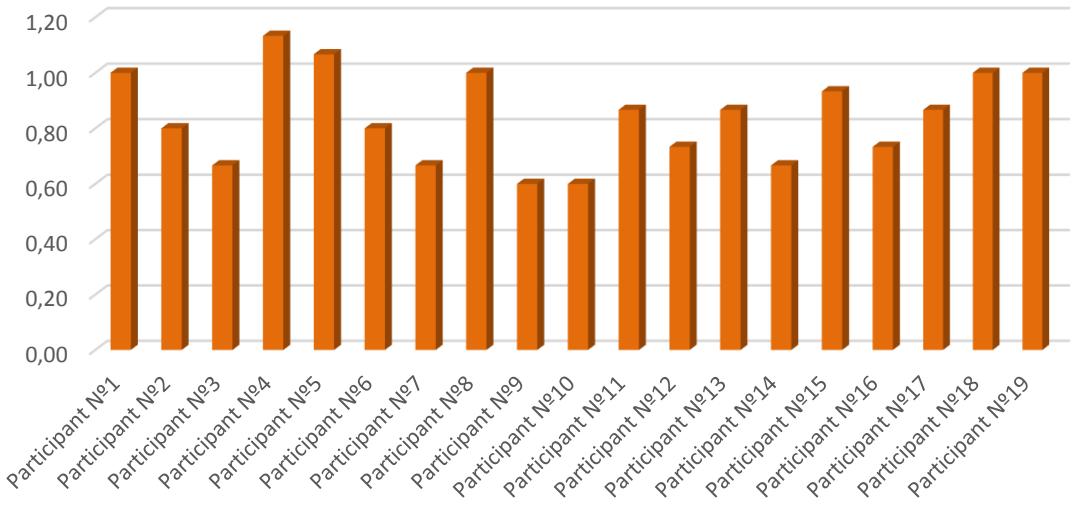


Figure 4.29 Average of absolute variation verified between both self-assessments.

Moreover, a simple examination concerning the amount of categories engaged and the different natures encountered throughout this analysis was performed and is synthesized as follows:

a) The percentage of answers changed among self-assessments, exposed on Table 4.19 and Figure 4.30;
b) The percentage of absolute variation verified in self-assessments, exposed on Table 4.20 and Figure 4.31;

Table 4.19 The percentage of total answers changed among both of self-assessments.

I/0 Index	I	0	Total
Nº of Occurrences	176	109	285
% of Occurrences	61,75%	38,25	100

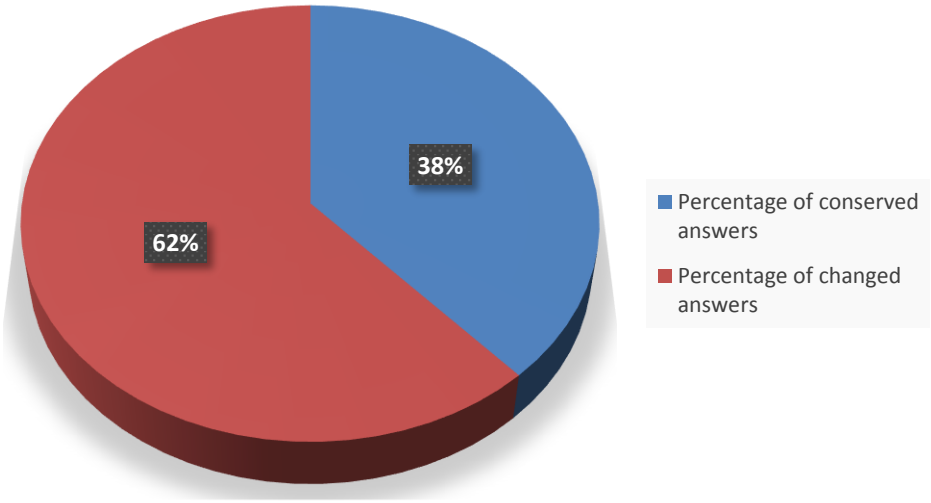


Figure 4.30 Percentage of total answers changed among both self-assessments.

Table 4.20 The percentage of absolute variation verified in self-assessments.

Absolute value of Variation	**0**	**1**	**2**	**3**	**4**	**Total**
Nº of Occurrences	109	123	50	7	0	285
% of Occurrences	37,7%	42,6%	17,3%	2,4%	0%	100%

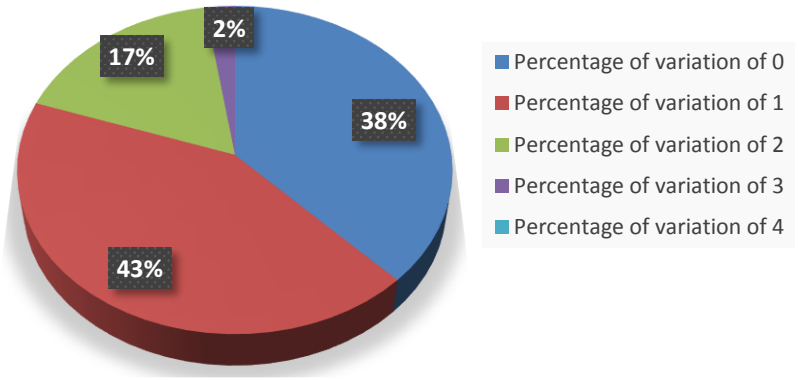


Figure 4.31 Percentage of absolute variation verified in self-assessments.

Furthermore, an analysis aiming to examine the nature of the dispersion in the results was also attempted. Such was accomplished by organizing the answers provided, according to the different goals assessed. In other words, the collected data was arranged by assessed goal and hence the averages calculated were prepared according each goal of every participant. On Table 4.21 is the evaluation and data arrangement of the first participant. This brings out the possibility to visualize the data in ways in that we can verify the homogeneity of the data collected, as illustrated on Figure 4.32 and Figure 4.33, corresponding to the radar charts representing the distribution of answers changed by goal, as well as variations between self-assessments, according to each participant.

Table 4.21 Summary of the data analyzed concerning the first participant.

Goal	Parameter	Self-Assess. 1	Vignette 1	Vignette 2	Self-Assess. 2	I / O	Variation	Average of % of changes	Average of Variation
S01 - G01	Level of Implem.	2	3	2	3	1	1	100%	1,67
	Capacity to Influen.	4	4	2	2	1	2		
	Severity of the Cons.	3	3	3	5	1	2		
S03 - G04	Level of Implem.	3	3	2	3	0	0	67%	0,67
	Capacity to Influen.	3	3	1	4	1	1		
	Severity of the Cons.	3	5	3	4	1	1		
S02 - G05	Level of Implem.	2	4	2	2	0	0	67%	1,33
	Capacity to Influen.	2	2	1	4	1	2		
	Severity of the Cons.	3	5	2	5	1	2		
S01 - G09	Level of Implem.	2	3	2	3	1	1	67%	0,67
	Capacity to Influen.	2	3	2	3	1	1		
	Severity of the Cons.	3	2	1	3	0	0		
S04 - G03	Level of Implem.	3	4	3	4	1	1	67%	0,67
	Capacity to Influen.	2	5	4	3	1	1		
	Severity of the Cons.	2	4	2	2	0	0		

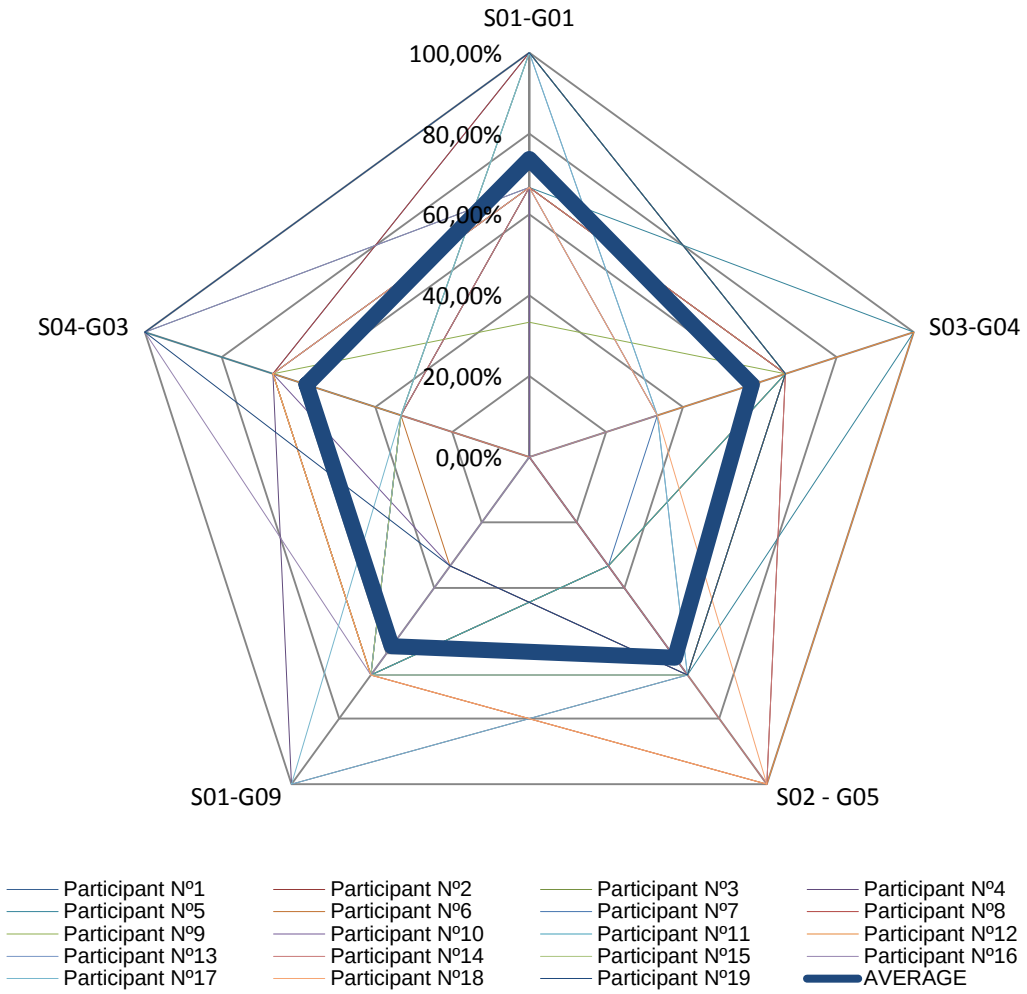


Figure 4.32 Percentages of answers modified by assessed goal

Thus, it is fair to sustain that there is a consistent tendency to change the answers provided subsequently to vignette's assessment, as far as collected results are concerned. Moreover it is possible to verify that the results are homogeneously distributed along the different goals assessed. This is verified by the similarity observed between the shape of the average from the collected data and the outlined pentagon of the chart.

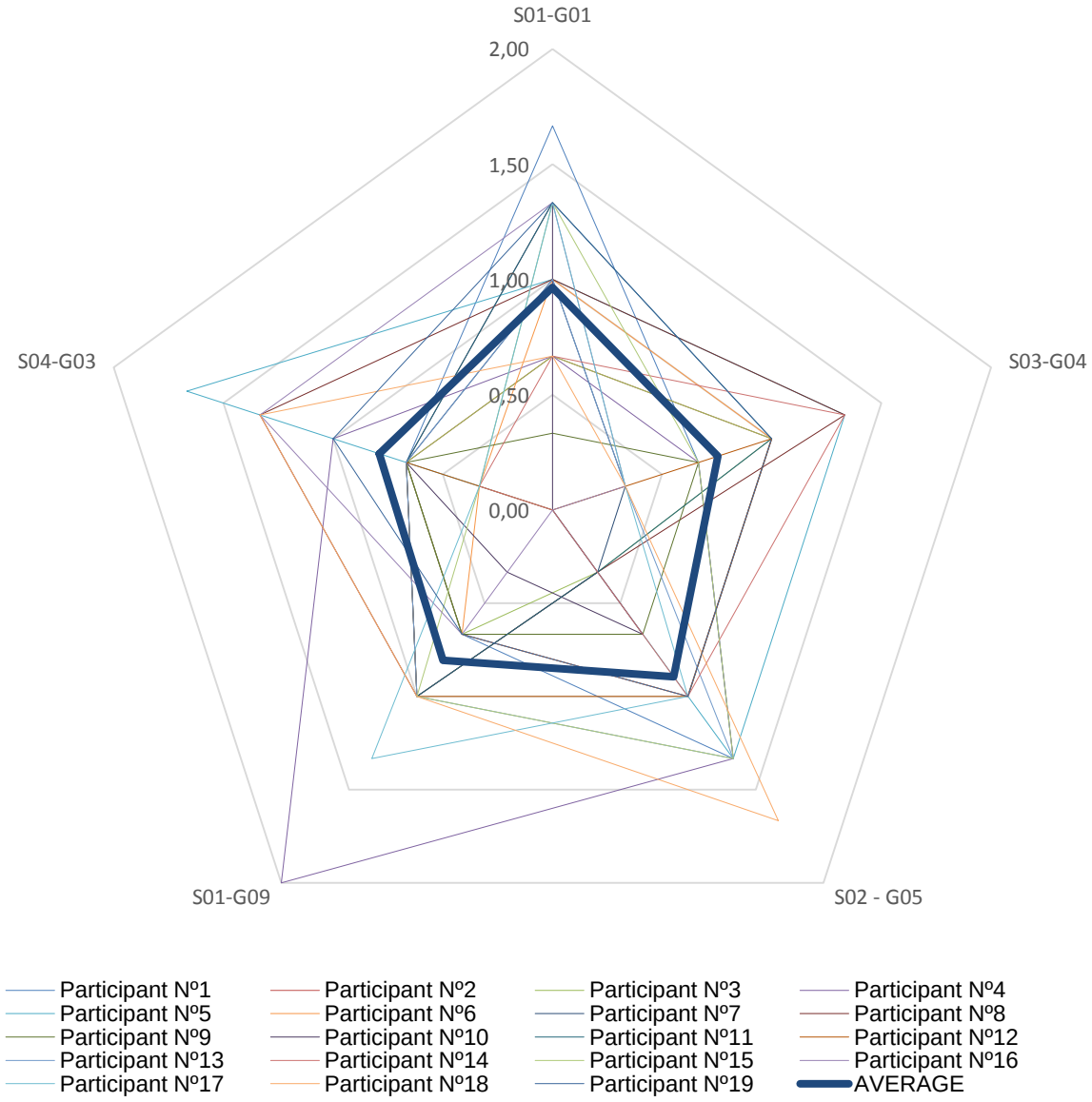


Figure 4.33 Participant's average of absolute variations between self-assessments per assessed goal.

Hence, it seems reasonable to state that there is a regular predisposition to change the answers provided subsequently to vignette's assessment, as far as collected results are concerned, and that the matching average reflects a variation of 1 per assessed goal. Additionally, like the previous radar chart, it is possible to verify that the results seem homogeneously distributed along the different goals assessed, verified by the similarity observed between the shape of the average from the collected data and the outlined hexagon of the radar chart.

4.4.3 Case Study – Response Analysis

Besides studying the differences verified among self-assessments, the vignettes' corrective model was analysed and it was studied if it is possible to reduce the bias of the results gathered, providing a standardized risk assessment within the tool Spotrisk. Hence, the vignettes were anchored and the model presented on the chapter corresponding to the methodology employed, was tersely applied.

Attending as an example, it was again analyzed the first participant's answers, now concerning the 2nd self-assessment on capacity to influence over S03-G04 (4th goal from capability stage), which corresponding data can be verified on Table 4.22, and it can be corrected through the anchoring of assessed vignettes as illustrated on the figure bellow.

Table 4.22 Corrected value according to *Anchoring Vignettes*.

Goal	*Parameter*	*Self-Assessment 1*	*Vignette 1*	*Vignette 2*	*Self-Assessment 2*	***Corrected Value***
S04-G03	Capacity to Influence	2	5	4	3	1

After analyzing the table above it's fair to affirm that the matching participant changed his perception of the corresponding project's risk, after assessing the vignettes situation. Subsequently, the value of the second self-assessment was raised from "2" to "3", as pointed out in the table above. However, since both of the vignettes' assessment reflect a higher risk than the self-assessment nº2, and because they are previously anchored by the model in ratings "4" (high) and "2" (low), it's is then possible to collect an anchored and corrected value of the risk from the participant's project. The participant's perception is therefore adjusted and the outcome is normalized to a result of "1" (very low), as showed both in the Figure 4.34 and Table 4.23.

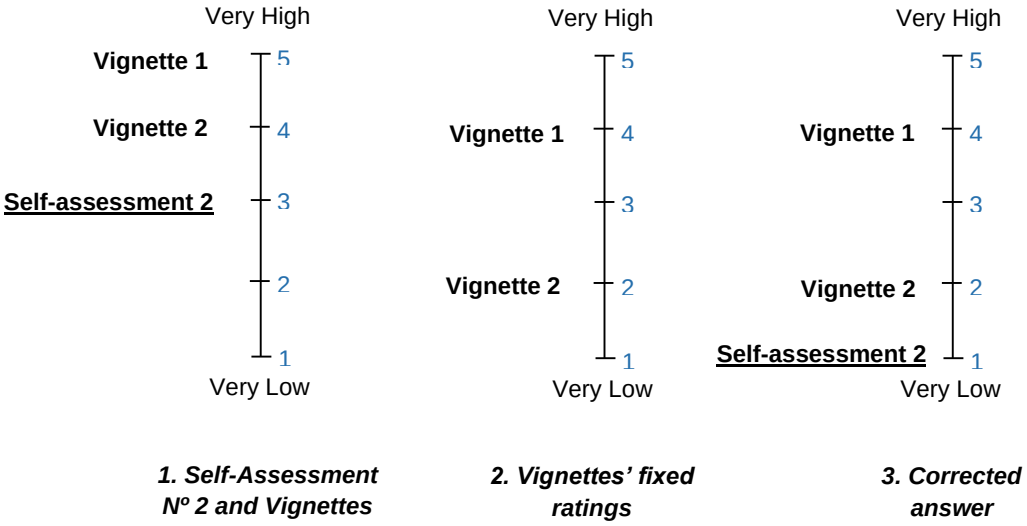


Figure 4.34 Corrected value of self-assessment 2.

The same analysis was performed concerning every participant, available on Appendix XIII and with an excerpt from the first participant's results on Table 4.23. However this process is only possible with vignettes strategically anchored, in order to endorse and normalize all participants' answers. In other words, it's only possible to extent every answer with vignettes anchored in "low" (2) and "high" (4), otherwise it's not conceivable to know which normalized result corresponds to the perceived values.

For example, let's imagine that the vignettes are previously anchored as "low" (2) and "low" (2). Now, if a participant rates the vignettes as "medium" (3) and "very low" (1) and the self-assessment of his own project as "high" (4), it's not possible to hook the new adjusted answer in any correct and specific value. This is due to the fact that when the assessed vignettes are transposed to the anchored values of "2" and "2", the self-assessment that had a higher rating than both vignettes can now adopt any value from "3" to "5", being unable to normalize any result.

In our specific case, the vignettes are anchored on "low" (2) and "high" (4) for the column of both "Level of implementation" and "Capacity to Influence", but on "high" (4) and again "high" (4) for the column of "Severity of the Consequences". For the reason that the vignettes are anchored in the same value on the column of "Severity of the Consequences", it's not possible to hook a singular normalized value and thus this analysis was performed only for the parameters "Level of implementation" and "Capacity to Influence". Furthermore, the possible combination of results is displayed on Table 2.5 from literature review, being that z_1 is equivalent to vignette 2 and z_2 equivalent to vignette 1, concerning the example above.

Table 4.23 Corrected values, according to *Anchoring Vignettes* – participant 1.

Goal	***Parameter***	***Self-Assessment 1***	***Vignette 1***	***Vignette 2***	***Self-Assessment 2***	***Corrected Value***
S01 - G01	*Level of Implementation*	2	3	2	3	4
	Capacity to Influence	4	4	2	2	0
S03 - G04	*Level of Implementation*	3	3	2	3	4
	Capacity to Influence	3	3	1	4	5
S02 - G05	*Level of Implementation*	2	4	2	2	0
	Capacity to Influence	2	2	1	4	5
S01 - G09	*Level of Implementation*	2	3	2	3	4
	Capacity to Influence	2	3	2	3	4
S04 - G03	*Level of Implementation*	3	4	3	4	4
	Capacity to Influence	2	5	4	3	1

Now, in this second approach, the vignettes were anchored and the model employed was applied. However, it remains as a problem the lack of a method to verify if the new standardized values correspond to the reality of the project and if the bias was effectively reduced.

The utmost accurate method to understand if the bias was effectively reduced is off course by following the project's development through time and by checking and confirming if the risk previously calculated was actually a truthful reflection of the project's reality. Yet, it's appropriate to pursuit a method to somehow determine its authentication. Such was endeavored by attesting the tendency of second self-assessments relatively to the final standardized value.

Hence, alongside with its application, a supplementary analysis aiming to verify the tendency of answers was endeavored. In this analysis it is performed a comparison between the variation from self-assessments and variation from self-assessment nº2 to standardized values. In other words, it is verified if the answer was changed between self-assessments and if that change approaches or it deviates from the final standardized value.

In title of example, let's say that the first and second self-assessments were rated 4 and 3 correspondingly, while the first and second vignettes were given a 3 and 2 correspondingly, generating a corrected value of 4. On the Figure 4.35 is represented an illustration from this example, where the tendency is deviated. We can see that the risk is risen between self-assessments, and that with the results from assessed vignettes it is concluded that the standardized risk should be anchored at a value below the second self-assessment. From the difference in variations, represented by the different arrows, it is thus verified that the standardized value deviates itself from the tendency of change observed between self-assessments.

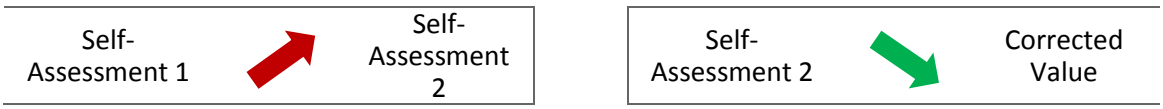


Figure 4.35 Illustration of a deviated tendency between both self-assessments and corrected value.

Concerning the tendency indicator, other situations may occur, such as an approach tendency, or null tendency. If the variation in self-assessments is null and both of their value is the same, then the tendency is considered null as well. Also, it can be found a null tendency if the standardized value stands between both of the self-assessments. On the Table 4.24 is an illustration from the different tendencies that can be verified, with examples verified over the case study.

Table 4.24 Tendency displayed between each self-assessment considering the correction registered with *Anchoring Vignettes*.

Goal	Parameter	Self-Assess. 1	Vignette 1	Vignette 2	Self-Assess. 2	***Corrected Value***	***Tendency after Vignettes***
S01-G09	*Level of Implement.*	4	5	4	3	1	Approach
S02-G05	*Capacity to Influence*	4	3	2	3	4	Deviated
S03-G04	*Level of Implement.*	3	5	3	3	2	Null

This analysis was performed for each and every participant in order to see if there is a propensity to observe specific tendencies from each final self-assessment relatively to the final corrected value, displayed on Table 4.25 and on Figure 4.36.

Table 4.25 Numbers and percentages of tendencies among answers.

Number of Approached Answers	**78 answers**
Number of Deviated Answers	**46 answers**
Number of Null Answers	**44 answers**
Percentage of Approached Tendency	**46,43%**
Percentage of Deviated Tendency	**27,38%**
Percentage of Null Tendency	**26,19%**

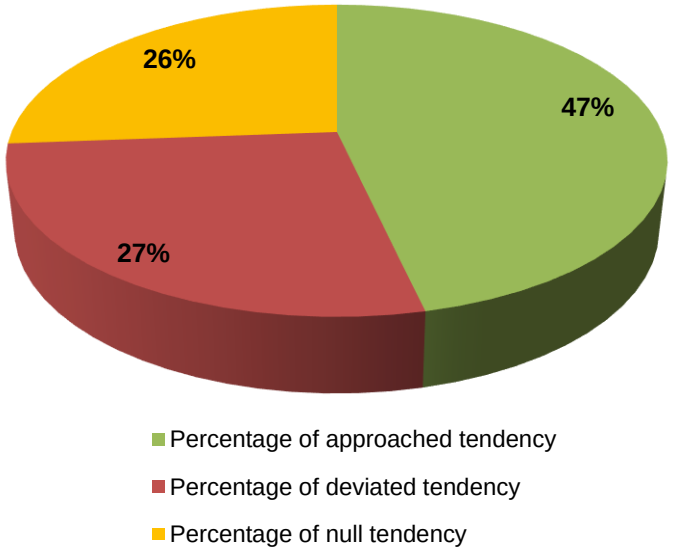


Figure 4.36 Distribution of answer's tendency

From this analysis it's possible to verify that there is a propensity to observe a higher tendency of approximation from each final self-assessment relatively to the final standardized value. Likewise, it is reasonable to conclude that there was a great number of changed answers in consequence of the vignettes' assessment, which leads to a belief that there is a standardization of perceptions.

Nevertheless, it is not possible to attest if the bias was effectively reduced, for it is not possible to find theoretically if any resemblance or differences with the practical reality of the project. To do that it would be necessary to follow the project's development through time and to check if the risk previously calculated reflects an accurate consideration of the project's reality.

4.5 Correlation between Models's Outputs

The nature of models applied and subjects studied suggest that the *Gambling Task* can be linked with some of the outputs generated from the application of *Anchoring Vignettes.* Ensuing the hypothesis nº4, it is expected that the number of plays performed until reaching a decision during the *Gambling Task* (υ_1) may be correlated with the sum of the absolute variation found between both self-assessments completed by each participant, along the five goals and three parameters (υ_2).

Regarding υ_1, it refers to the last row from Table 4.3, which represents the total number of plays performed until each of the nineteen participants makes a decision, exposed on Figure 4.37.

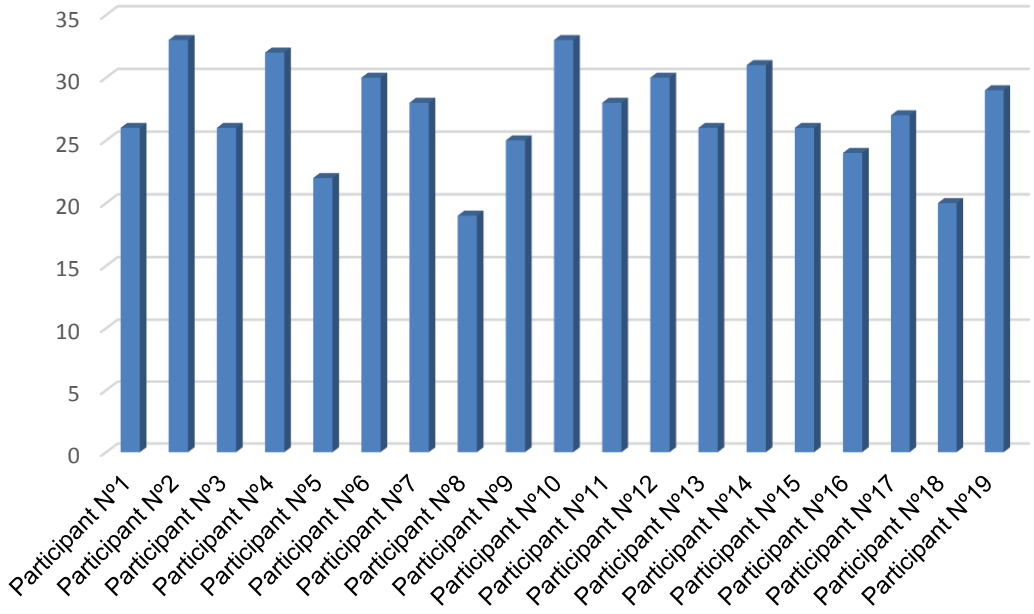


Figure 4.37 Total number of plays until each one of the participants makes a decision.

Regarding υ_2, illustrated on Figure 4.38, it refers to the entire information concerning the absolute variation verified between both self-assessments for all participants and for the all 15 issues attended – 5 goals along 3 parameters – exemplified in Table 4.19 and thoroughly available on Appendix XIII. It can also be related with Figure 4.29, but without the average factor.

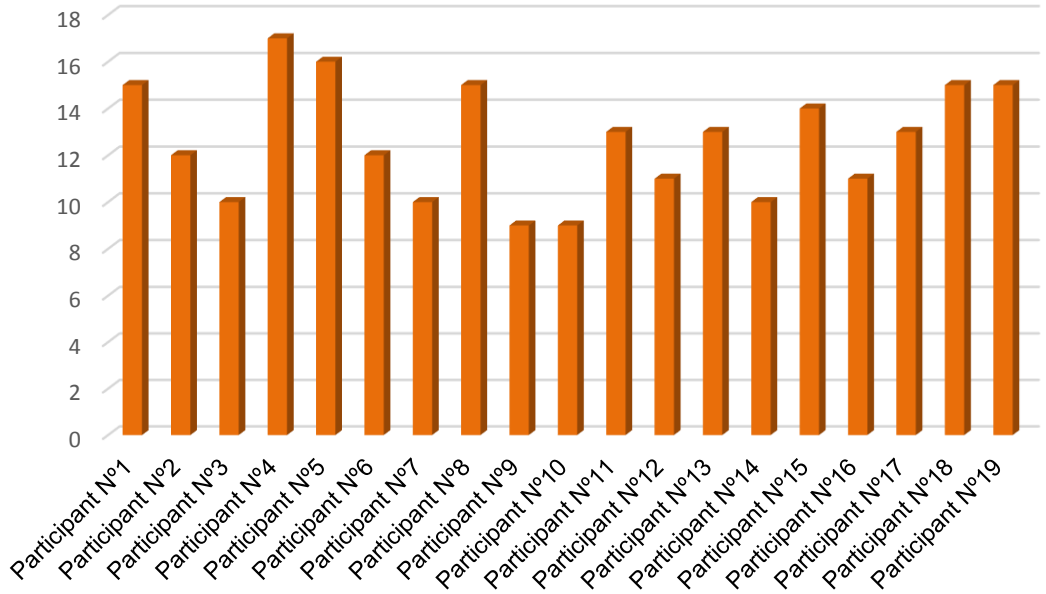


Figure 4.38 Sum of the absolute variation found between both self-assessments completed by each participant, along the five goals evaluated.

The designated variables were statistically treated by means of bivariate descriptive analysis with use of statistical analysis software PASW Statistics, being υ_1 a tangible result of the number of plays from each of the nineteen participants and υ_2 a difference of answers from the same nineteen participants among a groups of likert questionnaire, which just by itself can be treated as having a quantitative nature. Each of the designated variables was inputted in the software module as represented on Table 4.26.

Table 4.26 Variables inputted in the software PASW Statistics.

*Participant/**Variable***	υ_1	υ_2
Participant nº1	15	26
Participant nº2	12	33
Participant nº3	10	26
Participant nº4	17	32
Participant nº5	16	22
Participant nº6	12	30
Participant nº7	10	28
Participant nº8	15	19
Participant nº9	9	25
Participant nº10	9	33
Participant nº11	13	28

Participant nº12	11	30
Participant nº13	13	26
Participant nº14	10	31
Participant nº15	14	26
Participant nº16	11	24
Participant nº17	13	27
Participant nº18	15	20
Participant nº19	15	29

Having regard to the description above, it was proceeded a calculation of the index of correlation of Pearson (R) to determine the level of correlation between two variables υ_1 and υ_2, correspondingly represented by "*Variation*" and "*G_Task*". The Results of which are shown in the Tables 4.27 and 4.28, as well as a plot analysis in Figure 4.39.

Table 4.27 *PASW Statistics* - descriptive statistics

	Mean	**Std. Deviation**	**N**
Variation	12,6316	2,45426	19
G_Task	27,1053	4,02623	19

Table 4.28 *PASW Statistics* - correlations

Pearson Correlation	**- 0,339**
Sig. (1-tailed)	0,078
N	19

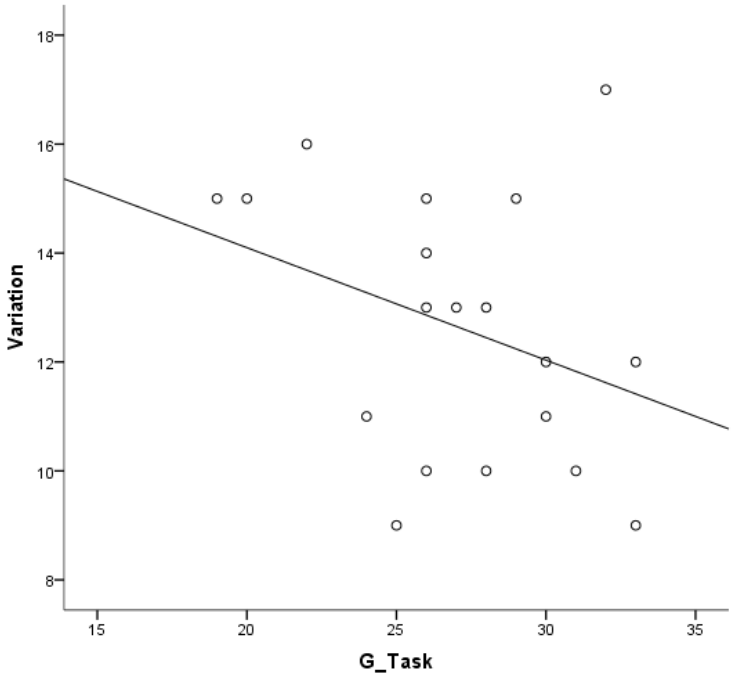


Figure 4.39 Plot Analysis relating the designated variables.

The utmost important inference that can be withdrawn from the results obtained is that, for the designated sample of 19 respondents, the two selected variables have a weak correlation (R = 0.339) in the opposite direction. This means that the greater is the absolute variation found between both self-assessments completed by each participant, the lower is the number of plays performed until each participant reaches a decision during the *Gambling Task* and vice versa (Figure 4.39).

This conclusion is only valid in descriptive terms for the sample, since that the significance value (p-value or sig) that quantifies the error associated with statistical inference, leads us not to reject the null hypothesis that the correlation coefficient is statistically equal to 0 for typical values of a maximum error of 5%.

5. Main Conclusions and Future Research

5.1 Main Conclusions

While performing decisions under uncertainty, heuristic principles are employed to reduce the complexity of the probability assessment task, which can be attached to biases and its reliance and trust differs according to each individual. This explains the existing variations in decision-making and risk attitude among individuals. Knowing that risk perception is the key variable that defines an individual's risk attitude and since entrepreneurs are widely recognized as risk-takers and sharp individualists, it is proper to affirm that they commonly recollect an inferior perception of the general risk involved over their activities, which subsequently suggests that they are driven by a superior use and reliability over biases and heuristics among their decisions, than their peers. Furthermore, these mental shortcuts in decision-making consist in a non-rational approach, which makes the behavior beneath uncertainty and risk intrinsically related with human emotion, and such topics closely related to neuroscience studies.

According to the described above, Damasio's *Gambling Task* was applied to a group of nineteen people, in order to assert if there are significant results which suggest that the measurement of the individual's risk perception is seemingly conceivable through *Gambling Task*. Although, there was an understanding that this distinction is not comprehensible with the sample attained, since the number of plays accomplished seemed fully arbitrary by the role embraced by participant. Consequently it is reasonable to say that, with the sample attained, the hypothesis nº1, concerning Damásio's Gambling Task application as a model to measure individual's risk perception, is seemingly rejected. However, there stand significant differences among the existing number of plays by participant, which utters that the sample could have been differently collected. Specifically it is suggested that, in the case participants would have been invited from different natures of businesses outside the SME cluster, results may have been slightly different.

Furthermore, SMEs, who are characterized by their adaptation capabilities and who takes a major role in the world's economy, need to adopt systematic processes to manage and control project's risks. However, project risk management practices and tools are either expensive or too complex and time-consuming, requiring extensively more efforts than those which managers in SMEs are generally willing to earn. Engaged on SMEs, Spotrisk® tool proposes to perform a horizontal risk management process among projects from all areas of business, which was submitted to a project development where flaws and inconsistences were improved and technical faults rectified. Also, internal and external validation tests took place.

Through the collected results it can be expect that the simple action of answering the developed questionnaire per se may provide the user an important awareness of critical risks inherent to a project, showing strong potential as to be an important tool for start-up incubators, due to the fact that the start-up enterprises associated are promptly the ones with less notion and tangibility with

the market. Therefore, besides making a capable risk assessment and generating factual risk strategies, the platform can also bring important awareness to individuals who, in most of the cases, were never exposed to exerted situations and events within an innovative project. These first empirical results provide the means to a favorable integration of a universal tool to support innovative projects development on SME's, regarding that the sample held embraced several distinct areas. Nevertheless, the available results are still limited to a short sample of projects in the same economic area. Therefore, it remains as a pending operation to evidence the universality of the goal oriented issues integrated in the platform, as well as to attest the hypothesis conjectured concerning Spotrisk® as being comprised as a valid and universal tool to support decision-making and reaches all areas of business from SMEs.

Also, due to the fact that it dwells as a cloud based interface, it is expected that: on one side, Spotrisk® will evolve with the users' activity in the platform, contributing incrementally with proactive feedback; on the other hand it will encourage companies to use tools to systematically improve the risk identification and management processes, associated with the development of new products and services. Hopefully, these tools will generate a positive impact by reducing project's costs, raising success rates, along with the entraining of a higher number of innovative projects into market.

Spotrisk® carries an inherent subjectivity on the project's risk assessment, as well as any other questionnaire driven processes, because each individual perceives the questions according to his own idiosyncrasy, which brings complications in normalizing risk profiles and thus in universalizing the platform. Thus, *Anchoring Vignettes* was applied, from which a model adaptation was hypothesized. The results show that there is a consistent tendency to change the answers provided subsequently to vignette's assessment and that the results are homogeneously distributed along the different goals assessed. Hence, the matching average reflects a variation of 1 per assessed goal.

However, regarding the third hypothesis conjectured, it's possible to verify that there is a propensity to observe a higher tendency of approximation from each final self-assessment relatively to the final standardized value. As well, it is rational to determine that there was a great number of changed answers in consequence of the vignettes' assessment, which leads to a belief that there is a standardization of perceptions. A similar phenomenon as in Spotrisk's validation was also noted, being that a general awareness of project's risks was induced onto participants. Although, the time expended in answering each of the stages was a down factor, being noticeable a general dullness from participants in completing the tasks requested. Nonetheless, it is not possible to attest if the bias was effectively reduced, for it is not possible to find theoretically if any similarity or differences with the practical reality of the project. To do that it would be necessary to follow the project's development through time and to check if the risk previously calculated reflects an accurate consideration of the project's reality.

Lastly, concerning the hypothesis nº4, the number of plays performed until reaching a decision during the Gambling Task (υ1) have a weak correlation (R = 0.339), in the opposite direction, with the sum of the absolute variation found between both self-assessments completed by each participant (υ2). Thus there is a weak connection stating that the greater is the absolute variation found between both self-assessments completed by each participant, the lower is the number of plays performed until each participant reaches a decision during the Gambling Task and vice versa. Tough, this conclusion is only valid in descriptive terms for the sample, since that the significance value (p-value or sig) that quantifies the error associated with statistical inference, leads us not to reject the null hypothesis. This leads to believe that with a probabilistic sample results may have been different. However, there are very few studies that undergo such exploratory endeavours by relating Engineering or Management topics with Neuroscience and Psychology, therefore continuing involvements and experiences hopefully may occur in the future.

5.2 Future Work

Since very few studies endeavors on exploratory conceptualization of approaches subjects, this work generated a spectrum of topics to be developed on future researches. It is thus recommended that an analysis along the developed topics may be performed, as following designated.

Individual's Risk Behavior

The results provided from the analysis over *Gambling Task* exhibit significant differences among the existing number of plays by participant. Henceforth it is recommended that a different nature of sample gathering may be collected. Specifically it is suggested that participants may be summoned from different natures of businesses outside the SME cluster, as well as to endeavor on a categorization of different types of professional positions. Furthermore it can be useful to create a specific scale according to the number of plays engaged by participant, in order to create definite risk profiles.

Also, different conceptualizations from the *Gambling Task* can be explored concerning the landmarks dividing the different periods of performance found during Damasio's experience, and link the different stages with new inquiries. Also different applications of the experience can be made, where instead of using the number of plays factor it might be useful to consider other approaches.

Also further studies on neuroeconomics are recommended, for it relates indisputably linked subjects from management and neuroscience which are very recent and unquestionably important.

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The available results are still limited to a short sample of projects in the same economic area. Therefore, it remains as a pending operation to evidence the universality of the goal oriented issues integrated in the platform. Also, it stands as future research to add an adequate strategy of response with an integrated list of specific advices, linked to a group of concrete actions to attend to risks accordingly, so that SME's may be driven thoroughly and systematically to suitable risk management practices. Also, a research on the possibility of differentiation of the goal responses by threats and opportunities, being able to relativize the impact positive or negative (or both) of the risks associated, can be attended.

Anchoring Vignettes

From the results provided in the application of *Anchoring Vignettes* it was not possible to attest if the bias was effectively reduced, because it was not possible to find in theoretical methods if any similarity or differences with the reality of the project. To do that, it is suggested that the project is followed throughout and to check if the risk previously calculated reflects an accurate consideration of the project's reality. Also, the content of each vignette must be appraised, because its creation and adaptation was performed according to the perception of the author and can be primarily biased from its generation. Furthermore, other parameters may be analysed, as well as the nature of participants, where similarly to Gambling Task, the participants summoned should arise from different natures of businesses outside the SME cluster and differente types of professional positions.

Moreover, asking vignettes may seem like an expensive technique since it requires adding multiple questions to a survey to correct for each self-assessment question. For future research, King et al. (2004) developed a statistical technique that enables one to ask *Anchoring Vignettes* of only a small random subsample and to still statistically correct for bias using parametric assumptions, being that the same technique can also be applied to respondents who were not asked all questions and thus facilitate the whole process.

Finally, concerning the statistical analysis, stands as pending research a possibility to study other variables relating the *Gambling Task* with *Anchoring Vignettes* besides number of plays and variation of self-assessments, as well as link other neuroscience models with project risk models and methodologies.

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Appendix

Appendix I

Table I.1 Total number of possible risk scores along RDM.

Score:
- * = At least 50% of the scores is found in 1st and/or 2nd column and none in 5th column;
- 0 = At least 50% of the scores is found in 4th and/or 5th column and none in de 1st column;
- M = At least 50% of the scores is found in 3rd column;
- ? = For all the remaining cases (wide distribution in opinions or remarkably deviating opinions). This score may eventually lead to a '*', '0' or 'm', after examinations and discussions between members in the risk team.

SCORE			RISK CLASS	SCORE			RISK CLASS
Certainty	Ability of team to influence course of action	Relative importance to project success		Certainty	Ability of team to influence course of action	Relative importance to project success	
*	*	*	F	*	*	?	M-F
*	*	0	L	*	?	*	H-F
*	0	*	M	?	*	*	M-F
0	*	*	H	*	?	?	L-F
0	0	*	L	?	*	?	L-F
0	*	0	L	?	?	*	L-F
*	0	0	L	?	?	?	S-F
0	0	0	S	?	0	0	L
*	*	m	H	0	?	0	L
*	m	*	H	0	0	?	L
m	*	*	H	?	?	0	S-M
*	m	m	M	?	0	?	S-H
m	*	m	M	0	?	?	S-M
m	m	*	M	*	?	0	L-M
m	m	m	M	*	0	?	L-H
0	*	m	M	0	*	?	L-M
*	0	m	M	0	?	*	L-M
0	m	*	M	?	0	*	L-H
*	m	0	M	?	*	0	L-M
m	*	0	M	*	?	m	M-H
m	0	*	M	*	m	?	M-H
0	0	m	L	m	?	*	M-H
0	m	0	L	m	*	?	M-H
m	0	0	L	?	m	*	M-H
0	m	m	M	?	*	m	M-H
m	m	0	M	m	?	0	L-M
m	0	m	M	m	0	?	L-M
				0	?	m	L-M
				0	m	?	L-M
				?	0	m	L-M
				?	m	0	L-M
				?	m	m	L-M
				m	?	m	M
				m	m	?	M
				?	?	m	L-H
				?	m	?	L-H
				m	?	?	L-H

mean of the risk classification:

- F = Fatal risk;
- H = High risk;
- M = Medium risk;
- L = Low risk;
- S = Safe, no risk.

A combination of classes means that the risk team should work out whether the disagreement can be resolved and hence a single risk classification can be achieved. If consensus can't be achieved the worst possible case should be assumed.

Appendix II

Table II.1 Complete map of gains and losses from Damásio's *Gambling Task.*

Choice nº / Deck	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
A +10	0	0	-15	0	-30	0	-20	0	-25	-35	0	-35	0	-25	-20	0	-30	-15	0	0	0	-30	0	-35	0	-20	-25	-15	0	0	-35	-20	-25	0	0	0	-15	-30	0	0
B +10	0	0	0	0	0	0	0	0	-125	0	0	0	0	-125	0	0	0	0	0	0	-125	0	0	0	0	0	0	0	0	0	0	-125	0	0	0	0	0	0	0	0
C +5	0	0	-5	0	-5	0	-5	0	-50	-50	0	-25	-75	0	0	0	-25	-75	0	-50	0	0	0	-50	-25	-50	0	0	-75	-50	0	0	0	-25	-25	0	-75	0	-50	-75
D +5	0	0	0	0	0	0	0	0	0	-250	0	0	0	0	0	0	0	0	0	-250	0	0	0	0	0	0	0	0	-250	0	0	0	0	-250	0	0	0	0	0	0

Appendix III

Spotrisk's goal oriented questionnaire.

Idea stage

1. The idea has a clear business proposition: operational, cost, product, customer or resource leadership.
2. The idea has "springboard potential" (i.e. good prospects to become products or services).
3. The idea has a value proposition with unique points, clear for buyers and partners.
4. The project proposal is based on convincing market research
5. The project team has listed all the characteristics that the intended client seeks in the product/service.
6. The target market is well defined and there are clearly described channels.
7. There is a proposal for an effective action plan including eventual contingencies.
8. The team has clearly identified channels to access external knowledge and skills regarding technology, marketing and management.
9. Outsourcing solutions have been identified and are available.
10. The idea is free of eventual property rights disputes.
11. Possible ideas under development from competitors have been described.
12. There is a clear list of competitors by market segment.

Feasibility stage

1. The team possesses the critical competences to develop, produce and market the intended product/service.
2. Partners will deliver in time, with all the specifications as agreed upon.
3. Organization and relations within the team members and partners are clear and goal oriented.
4. The product/service will meet all requirements in terms of licenses, safety, environment, regulations, or others.
5. The company is ready to provide future after sales services.
6. The product/service will satisfy demands and expectations from stakeholders and external bodies/agencies.
7. Financial resources are guaranteed to develop the product/service.
8. The product/service can be delivered with prices that are acceptable to buyers.
9. The product/service will contribute to the long term financial position of the company.

Capability Stage

1. There is a clear production/supply process to provide a reliable product delivery.
2. Future scaling up of process has been clearly addressed and described.

3. Prototypes of the product/service have been tested to reach clear pre-defined criterion.
4. Schedule and costs are realistic and achievable.
5. Sales projections for the new product/service are based on consistent data.
6. There is contingency plan to correct schedule and cost deviations along the project.

Launch stage

1. There is an action plan to react to competitors' response to the introduction of the product/service.
2. The roll out of the product/service will happen as planned without information leaks.
3. There is a plan to increase and protect the barriers that the new product/service will create against competitors.
4. The key opinion makers are identified and assured.
5. There is a clear process to measure the product acceptance and marketing & sales.
6. There is a clear strategy to spread the marketing information through multiple channels.
7. A clear ratio of cost/income will be monitored during the launch processes.
8. A financial budget and monthly burn-rate thresholds are clearly defined.

Appendix IV

Table IV.1 (Cont.) Thorough list of created Vignettes created as an adaptation of model for Spotrisk®.

Stage	Vignettes	Questions	Level of Implementation	Capacity to Influence	Severity of the Consequences
Idea stage					
Value Proposition: **Vignette 1**	Ricky is a senior manager from a small tech company who is strongly devoted to his motivated, determined and resourceful team. They are thinking of creating an affordable mobile application to diagnose the user's skin condition, through pattern recognition technology, in which advises the user to get proper medical attention if necessary. Being that they have little serious competition, they created the following business value proposition: "One person dies of melanoma every 62 minutes. We offer a dermatoscope app for iPhone and Android that enables people to easily diagnose their skin, leveraging pattern recognition technology trusted by the World Health Organization". (4 – 4 – 2)	1. The idea has a clear business proposition: operational, cost, product, customer or resource leadership.	- Select Item -	- Select Item -	- Select Item -
		2. The idea has "springboard potential" (i.e. good prospects to become products or services).	- Select Item -	- Select Item -	- Select Item -
		3. The idea has a value proposition with unique points, clear for buyers and partners.	- Select Item -	- Select Item -	- Select Item -
Value Proposition: **Vignette 2**	Moses has a marketing company with a team of few members, from totally different professional areas. They are thinking of creating a pillow incorporated with a dedicated alpha-waves frequency transmitter to decrease the electrical brain activity, attempting to quickly achieve a person's deep relaxation state. Their value business proposition is: "Aimed at an ease state of sleep we endeavored your pillow using alpha-waves transmission to fastening your brain into a low activity effectiveness cycle" (2 – 2 – 2)	1. The idea has a clear business proposition: operational, cost, product, customer or resource leadership.	- Select Item -	- Select Item -	- Select Item -
		2. The idea has "springboard potential" (i.e. good prospects to become products or services).	- Select Item -	- Select Item -	- Select Item -
		3. The idea has a value proposition with unique points, clear for buyers and partners.	- Select Item -	- Select Item -	- Select Item -

Table IV.1 (Cont.) Thorough list of created Vignettes created as an adaptation of model for Spotrisk®.

Stage	Vignettes	Questions	Level of Implementation	Capacity to Influence	Severity of the Consequences
Idea stage					
Target Market: **Vignette 3**	Joshua is a musician and has a professional recording studio at home and he noticed that several of his musician friends and general contacts needed a place to rehearse and record, in which they could spend more time. He investigated the prices charged by nearby studios and added 1€ to the standard price, per extra hour. He also bought a few sofas, a vending machine and a few other accessories, to which a few friends gave an opinion. Plus he created a Facebook profile for his studio's business. (2 – 2 – 2)	4. The project proposal is based on convincing market research	- Select Item -	- Select Item -	- Select Item -
		5. The project team has listed all the characteristics that the intended client seeks in the product/service.	- Select Item -	- Select Item -	- Select Item -
		6. The target market is well defined and there are clearly described channels.	- Select Item -	- Select Item -	- Select Item -
Target Market: **Vignette 4**	Sheri owns a small interior design company. Her skilled and cooperating team won the second prize in YIDA awards. This year they are engaging in a new project in which they performed a market research through telephone interviews and online surveys, reaching 22% of the targeted population, where respondents replied which factors were considered to be more important in the interior design market and how much were they willing to pay for specific products. The target population is sophisticated and traditional homeowners, between the ages of 35-65, with incomes of at least 100.000€/year in Cascais, Portugal. They are advertising through target's homes via brochure, and also they have an elaborate website, Facebook and twitter profiles. (4 – 4 – 2)	4. The project proposal is based on convincing market research	- Select Item -	- Select Item -	- Select Item -
		5. The project team has listed all the characteristics that the intended client seeks in the product/service.	- Select Item -	- Select Item -	- Select Item -
		6. The target market is well defined and there are clearly described channels.	- Select Item -	- Select Item -	- Select Item -

Table IV.1 (Cont.) Thorough list of created Vignettes created as an adaptation of model for Spotrisk®.

Stage	Vignettes	Questions	Level of Implementation	Capacity to Influence	Severity of the Consequences
Idea stage					
Core Competences: **Vignette 5**	Harry is manager of a startup inside of a business incubator. Leaning on the guidance expertise from the incubator directors, and counting with the support of a team of recently graduated journalists, he is engaging in a project of creating an innovative online newspaper. They solo presented a project plan of 3 years that included transportation and human resources costs but it didn't include the office expenses and online liabilities. The cash flows diagram estimated a profit with a positive VAL for the end of the third year. They are entirely counting on the incubator director's expertise and availability, if necessary. (2 – 2 – 2)	7. There is a proposal for an effective action plan including eventual contingencies.	- Select Item -	- Select Item -	- Select Item -
		8. The team has clearly identified channels to access external knowledge and skills regarding technology, marketing and management.	- Select Item -	- Select Item -	- Select Item -
		9. Outsourcing solutions have been identified and are available.	- Select Item -	- Select Item -	- Select Item -
Core Competences: **Vignette 6**	Eunice is a manager who defines clear goals for her project team. Her team is disciplined, shows commitment to projects and has some experience in applying to project support funds. They are submitting their project for several community's economic and social cohesion monetary funds and investors. They are developing a project plan with a 5 year project charter, ramified WBS and PBS, cash flows analysis, CPI and SPI control and a controlled and feasible critical path with strategic gaps for eventual cost or schedule contingencies. In the project charter they allocated costs and human resources, to which they already advanced contacts with external sources of know-how within a consulting enterprise, presenting the idea. (4 – 4 – 2)	7. There is a proposal for an effective action plan including eventual contingencies.	- Select Item -	- Select Item -	- Select Item -
		8. The team has clearly identified channels to access external knowledge and skills regarding technology, marketing and management.	- Select Item -	- Select Item -	- Select Item -
		9. Outsourcing solutions have been identified and are available.	- Select Item -	- Select Item -	- Select Item -

Table IV.1 (Cont.) Thorough list of created Vignettes created as an adaptation of model for Spotrisk®.

Stage	Vignettes	Questions	Level of Implementation	Capacity to Influence	Severity of the Consequences
Idea stage					
Competition: **Vignette 7**	Carolyn owns a small online delivery business platform. Her project team is characterized by their knowledge and trusty environment surrounding their work. They have protected the intellectual rights of title and logos through a national trade mark (with 1 class) and with community trade mark within the European Union (with 2 classes). They also verify on a daily basis several social networks, threads, blogs, and forums the trends and the public opinion of each of the listed competitor's products from their intended segment. (4 – 4 – 2)	10. The idea is free of eventual property rights disputes.	- Select Item -	- Select Item -	- Select Item -
		11. Possible ideas under development from competitors have been described.	- Select Item -	- Select Item -	- Select Item -
		12. There is a clear list of competitors by market segment.	- Select Item -	- Select Item -	- Select Item -
Competition: **Vignette 8**	Jimmy is starting an online business of book trading. He protected the name and image through national trade marks (with 1 class). As soon as he came up with his idea he looked for all existing similar businesses and filtered the advantages to index to his idea and implement it. (2 – 2 – 2)	10. The idea is free of eventual property rights disputes.	- Select Item -	- Select Item -	- Select Item -
		11. Possible ideas under development from competitors have been described.	- Select Item -	- Select Item -	- Select Item -
		12. There is a clear list of competitors by market segment.	- Select Item -	- Select Item -	- Select Item -

Table IV.1 (Cont.) Thorough list of created Vignettes created as an adaptation of model for Spotrisk®.

Stage	Vignettes	Questions	Level of Implementation	Capacity to Influence	Severity of the Consequences
Feasibility Stage					
Core Competences: **Vignette 9**	James is a senior manager who decided to start an online sports broadcasting company. He trained his recruited graduates during the first two weeks and he is engaging in reconnecting with old partners from different areas of businesses. (2 – 2 – 2)	1. The team possesses the critical competences to develop, produce and market the intended product/service.	- Select Item -	- Select Item -	- Select Item -
		2. Partners will deliver in time, with all the specifications as agreed upon.	- Select Item -	- Select Item -	- Select Item -
		3. Organization and relations within the team members and partners are clear and goal oriented.	- Select Item -	- Select Item -	- Select Item -
Core Competences: **Vignette 10**	Daisy is a senior manager in a high tech company that produces solar modules and who is close to all project team's tasking development. The team is engaging in several coaching and training sessions, and they have already engaged in six coaching sessions to train competencies such as customer orientation, task control and use of tools. Project partners and members of the project team have well-defined roles and responsibilities, creating a trust network among partners and stakeholders. (4 – 4 – 2).	1. The team possesses the critical competences to develop, produce and market the intended product/service.	- Select Item -	- Select Item -	- Select Item -
		2. Partners will deliver in time, with all the specifications as agreed upon.	- Select Item -	- Select Item -	- Select Item -
		3. Organization and relations within the team members and partners are clear and goal oriented.	- Select Item -	- Select Item -	- Select Item -

Table IV.1 (Cont.) Thorough list of created Vignettes created as an adaptation of model for Spotrisk®.

Stage	Vignettes	Questions	Level of Implementation	Capacity to Influence	Severity of the Consequences
Feasibility Stage					
Marketing: **Vignette 11**	Dorothy is a curious leader of a disciplined and resourceful team from a design-software company. Her team, among other matters, is in charge of all the marketing, customer service/product support and after sales, as well as legal issues, to which they keep a constant heed on. They maintain a close attention to investors, local government, clients and other stakeholders to leverage the bonds created. (4 – 4 – 2)	4. The product/service will meet all requirements in terms of licenses, safety, environment, regulations, or others.	- Select Item -	- Select Item -	- Select Item -
		5. The company is ready to provide future after sales services.	- Select Item -	- Select Item -	- Select Item -
		6. The product/service will satisfy demands and expectations from stakeholders and external bodies/agencies.	- Select Item -	- Select Item -	- Select Item -
Marketing: **Vignette 12**	Charles and his sister Marlene have a company producer and adorner of snowboards. Together they handle all legal and product issues, as well as the marketing involved. They are mostly concerned with client's expectations, as well as client's reactions to competitor's products. (2 – 2 – 2)	4. The product/service will meet all requirements in terms of licenses, safety, environment, regulations, or others.	- Select Item -	- Select Item -	- Select Item -
		5. The company is ready to provide future after sales services.	- Select Item -	- Select Item -	- Select Item -
		6. The product/service will satisfy demands and expectations from stakeholders and external bodies/agencies.	- Select Item -	- Select Item -	- Select Item -

Table IV.1 (Cont.) Thorough list of created Vignettes created as an adaptation of model for Spotrisk®.

Stage	Vignettes	Questions	Level of Implementation	Capacity to Influence	Severity of the Consequences
Feasibility Stage					
Finance: **Vignette 13**	Marie has an online marketing and web analytics business with a team formed by representative members of each multiple organizational functions, to integrate their expertise and decentralize the decision-making authority. They have acquired a new key client in New Zeeland. The financial department got the project proposal approved, of 3 years length. The project will provide major intangible and fixed assets and the discussed price is within the range of the client's wallet. (4 – 4 – 2)	7. Financial resources are guaranteed to develop the product/service.	- Select Item -	- Select Item -	- Select Item -
		8. The product/service can be delivered with prices that are acceptable to buyers.	- Select Item -	- Select Item -	- Select Item -
		9. The product/service will contribute to the long term financial position of the company.	- Select Item -	- Select Item -	- Select Item -
Finance: **Vignette 14**	Richard has a small construction company with his brothers and they recently received a business proposal of finishing the surface of a client's villa. The client wishes to have the roof made of wood shingles or shake, which is amongst the most expensive roof types. However the client will only pay in the end and Moses needs to ensure the money for the construction. They re-proposed back to the client with a higher budget due to the existing uncertainties. (2 – 2 – 2)	7. Financial resources are guaranteed to develop the product/service.	- Select Item -	- Select Item -	- Select Item -
		8. The product/service can be delivered with prices that are acceptable to buyers.	- Select Item -	- Select Item -	- Select Item -
		9. The product/service will contribute to the long term financial position of the company.	- Select Item -	- Select Item -	- Select Item -

Table IV.1 (Cont.) Thorough list of created Vignettes created as an adaptation of model for Spotrisk®.

Stage	Vignettes	Questions	Level of Implementation	Capacity to Influence	Severity of the Consequences
Capability Stage					
Realization of Proposition: **Vignette 15**	Justin leads a small team that produces clothes in a company that designs, develops and produces clothes according to each client's will and desire. Their most recent project is to provide to each client the possibility to establish what he wants from a specific range of options, and to input it via website or mobile application. Nevertheless they may not be prepared for rapid production and delivery processes, as well as for reaching a larger number of target market. Also it is hard to know if the process is efficient or generally accepted by potential clients, for it has only been tested inside of the company with small user samples. (2 – 2 – 2)	1. There is a clear production/supply process to provide a reliable product delivery.	- Select Item -	- Select Item -	- Select Item -
		2. Future scaling up of process has been clearly addressed and described.	- Select Item -	- Select Item -	- Select Item -
		3. Prototypes of the product/service have been tested to reach clear pre-defined criterion.	- Select Item -	- Select Item -	- Select Item -
Realization of Proposition: **Vignette 16**	Ann leads a Research & Development team branded by their strong work ethic and motivation, in a company producer of new technologies of crystal display system for touch screen devices. They are engaging in the launch of a new crystal cell liquid, which has been tested in several Touch Screens, TFTs, OLEDs and LCDs. It will be used a production and distribution chain similar as the ones used for previous successful projects, which are also prepared to be extended in order to generate a larger number of production units, in the case the project turns out to be a success. (4 – 4 – 2)	1. There is a clear production/supply process to provide a reliable product delivery.	- Select Item -	- Select Item -	- Select Item -
		2. Future scaling up of process has been clearly addressed and described.	- Select Item -	- Select Item -	- Select Item -
		3. Prototypes of the product/service have been tested to reach clear pre-defined criterion.	- Select Item -	- Select Item -	- Select Item -

Table IV.1 (Cont.) Thorough list of created Vignettes created as an adaptation of model for Spotrisk®.

Stage	Vignettes	Questions	Level of Implementation	Capacity to Influence	Severity of the Consequences
Capability Stage					
Finance: **Vignette 17**	Roslyn owns a coffee house franchising with already 6 establishments all over the city. Within 1 year she plans have 3 more coffee houses on active, ready for the start of the European Capital of Culture event, which will take place in town. She and her skilled and determined team developed a project plan of 10 months to set up every coffee house, with a total cost of 450.000€ with resources, trespass and equipment included. The resources were allocated according to a feasible critical path and the non-dependent later activities were programmed in order to be re-scheduled, allowing the project to absorb costs and delays, if necessary. The sales projections were built around several demand growth reports from previous events and surveys across town, and they were modeled with the support of flexible and consistent software. (4 – 4 – 2)	4. Schedule and costs are realistic and achievable.	- Select Item -	- Select Item -	- Select Item -
		5. Sales projections for the new product/service are based on consistent data.	- Select Item -	- Select Item -	- Select Item -
		6. There is contingency plan to correct schedule and cost deviations along the project.	- Select Item -	- Select Item -	- Select Item -
Finance: **Vignette 18**	Elton holds a startup enterprise specialized in social media platforms and other information sources, supported by a business incubator. Moises and his entrepreneur team of 3 computer engineers and a financial analyst are attempting to launch a communication platform amongst startups and incubators, in order to easily trade information between them, worldwide. Their project plan lies on the construction of a social information and work platform within 6 months, with a total cost of 35.000€. They presented the project plan to the incubator directors with a Gantt chart with no gaps between allocations, making an effort to match the 6 month deadline. Their profit table was developed with the support of projections that resulted from several conversations and discussions amongst other entrepreneurs. (2 – 2 – 2)	4. Schedule and costs are realistic and achievable.	- Select Item -	- Select Item -	- Select Item -
		5. Sales projections for the new product/service are based on consistent data.	- Select Item -	- Select Item -	- Select Item -
		6. There is contingency plan to correct schedule and cost deviations along the project.	- Select Item -	- Select Item -	- Select Item -

Table IV.1 (Cont.) Thorough list of created Vignettes created as an adaptation of model for Spotrisk®.

Stage	Vignettes	Questions	Level of Implementation	Capacity to Influence	Severity of the Consequences
Launch Stage					
Competition: **Vignette 19**	Charlotte owns a small company that is exclusively responsible for the development of the technology used in the car keys of a major automobile company. Alison and her project team held tasks among product concept, feasibility, development, validation and commercialization. They are engaged in a project that consists in launching a technology to open a proprietor's car through a secure Bluetooth system via mobile, which was developed only with the knowledge of the research & development team and the COO of the major automobile company. This technology is classified as radical innovation by the company, which led to the development of barriers to boost this innovation, by protecting it and by disseminating it through the market. In the case that competitors consider it a threat and engage in the fabrication of similar opening systems, the team is already thinking in developing a voice recognition system car key. (4 – 4 – 2)	1. There is an action plan to react to competitor's response to the introduction of the product/service.	- Select Item -	- Select Item -	- Select Item -
		2. The roll out of the product/service will happen as planned without information leaks.	- Select Item -	- Select Item -	- Select Item -
		3. There is a plan to increase and protect the barriers that the new product/service will create against competitors.	- Select Item -	- Select Item -	- Select Item -
Competition: **Vignette 20**	Terry and his team constitute a young company that already organized a few musical and artistic events, mostly in their universities. Their project is to launch a tour where several musical bands will play in a bus, for one month, through 9 locations. They recruited several artists and created marketing plans. They considered assembling a brainstorm to discuss a few options, in the case that competitors respond with the announcement of a simultaneous event, but for the time they have been fully occupied with the organization of the event. Also, the need to spread the word, regarding the happening of the tour, was not compatible with the block of general information leaks. (2 – 2 – 2)	1. There is an action plan to react to competitor's response to the introduction of the product/service.	- Select Item -	- Select Item -	- Select Item -
		2. The roll out of the product/service will happen as planned without information leaks.	- Select Item -	- Select Item -	- Select Item -
		3. There is a plan to increase and protect the barriers that the new product/service will create against competitors.	- Select Item -	- Select Item -	- Select Item -

Table IV.1 (Cont.) Thorough list of created Vignettes created as an adaptation of model for Spotrisk®.

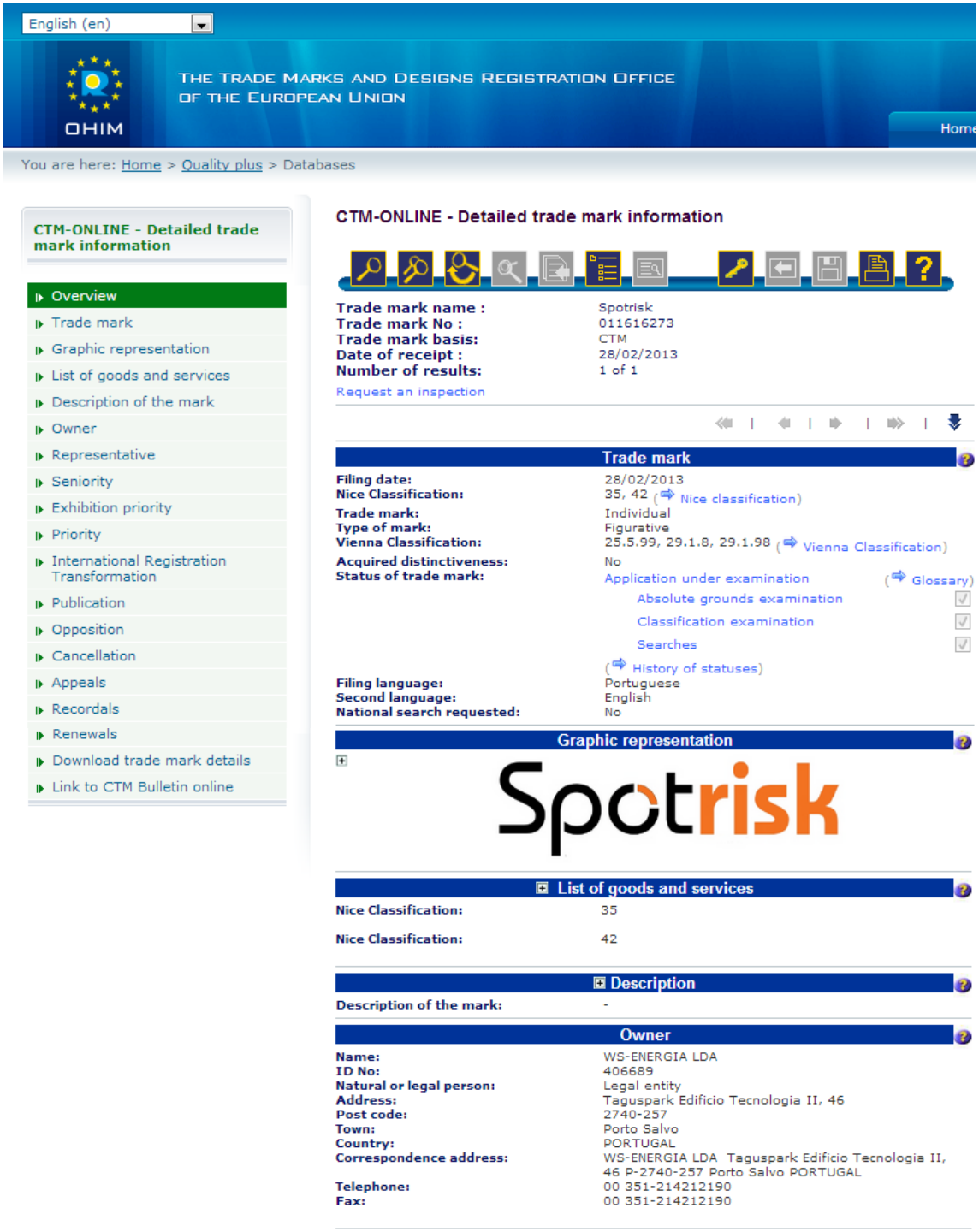
Stage	Vignettes	Questions	Level of Implementation	Capacity to Influence	Severity of the Consequences
Launch Stage					
Marketing: **Vignette 21**	Bobby started a company dedicated to the production and sales of naturally confectioned candies. Together with his team and their scarcely focused expertise in gastronomy, Moises is about to launch a new product into market which consists in chocolate-covered fruit pieces made from distilled natural fruit juice. They previously talked with restaurants and establishments with which they already had a connection with, presenting their new project. The public acceptance will be held across town, through the observation of sales history and general talk among clients. The strategy used to spread the word of the products' existence will be through a website and Facebook profile, as well as through direct business offers to new establishments. (2 – 2 – 2)	4. The key opinion makers are identified and assured.	- Select Item -	- Select Item -	- Select Item -
		5. There is a clear process to measure the product acceptance and marketing & sales.	- Select Item -	- Select Item -	- Select Item -
		6. There is a clear strategy to spread the marketing information through multiple channels.	- Select Item -	- Select Item -	- Select Item -
Marketing: **Vignette 22**	Deborah is an interested and curious manager who holds a high tech company and leads an experienced team who is rewarded according to their individual´s and team´s performance. They are engaged in a project of production and supply of an audio device that enables an instant translation from several languages to one another. They have established good connections with credible key opinion leaders among airlines, banks, ski resorts, hotels and restaurants, each of them well connected with their peers, as well as forums, tech blogs and magazines. In order to analyze the products' approval, it is established a plan to examine sales history, to survey clients and to study social and technical feedback through magazines, threads, online reviews, etc. The strategy used to extent the name and knowledge of the product was to disclose the project throughout the connections accomplished with opinion makers, as well as via websites, social networks and direct contact with major potential clients. (4 – 4 – 2)	4. The key opinion makers are identified and assured.	- Select Item -	- Select Item -	- Select Item -
		5. There is a clear process to measure the product acceptance and marketing & sales.	- Select Item -	- Select Item -	- Select Item -
		6. There is a clear strategy to spread the marketing information through multiple channels.	- Select Item -	- Select Item -	- Select Item -

Table IV.1 (Cont.) Thorough list of created Vignettes created as an adaptation of model for Spotrisk®.

Stage	Vignettes	Questions	Level of Implementation	Capacity to Influence	Severity of the Consequences
Launch Stage					
Finance: **Vignette 23**	Salvador owns a newly formed Biotech company that has been granted venture capital funds to pursue a groundbreaking new drug, with the help from his biotechnical team. The project plan was settled by Moises himself, who was given 5 years to reach breakeven or to become profitable. The costs are evaluated in the end of each trimester, along the whole project, until the 5 years are reached. A burn rate analysis is performed by the new venture firm in the end each semester to know if the money provided is enough to cover the shortfall of each period. In the case the venture capital firm lose their interest, it will be needed additional funding from venture capitalists, lenders or public offering, in order to continue operations. (2 – 2 – 2)	7. A clear ratio of cost/income will be monitored during the launch processes.	- Select Item -	- Select Item -	- Select Item -
		8. A financial budget and monthly burn-rate thresholds are clearly defined.	- Select Item -	- Select Item -	- Select Item -
Finance: **Vignette 24**	Bonnie leads a cooperating and trustworthy project team from an innovative enterprise, manufacturer of wind power turbines. Their most recent project consists on a quiet and efficient small wind turbine model that generates between 5 and 50 kilowatts, resulting from the innovative design of the blades. According to sales projections, the new product will generate cost/income ratios of around 0,555 within the first couple of months, engendering a close observation from the project team during the whole process. They have contracted venture capital funds to finish the project, which establishes a 6 years limit to reach breakeven point and a burn rate threshold of 50.000€ per month or 600.000€ per year. (4 – 4 – 2)	7. A clear ratio of cost/income will be monitored during the launch processes.	- Select Item -	- Select Item -	- Select Item -
		8. A financial budget and monthly burn-rate thresholds are clearly defined.	- Select Item -	- Select Item -	- Select Item -

Appendix V

Copyright form via trade mark registration in European Union Community Office.



English (en)

THE TRADE MARKS AND DESIGNS REGISTRATION OFFICE OF THE EUROPEAN UNION

OHIM

Home

You are here: Home > Quality plus > Databases

CTM-ONLINE - Detailed trade mark information

- Overview
- Trade mark
- Graphic representation
- List of goods and services
- Description of the mark
- Owner
- Representative
- Seniority
- Exhibition priority
- Priority
- International Registration Transformation
- Publication
- Opposition
- Cancellation
- Appeals
- Recordals
- Renewals
- Download trade mark details
- Link to CTM Bulletin online

CTM-ONLINE - Detailed trade mark information

Trade mark name : Spotrisk
Trade mark No : 011616273
Trade mark basis: CTM
Date of receipt : 28/02/2013
Number of results: 1 of 1

Request an inspection

Trade mark

Filing date: 28/02/2013
Nice Classification: 35, 42 (Nice classification)
Trade mark: Individual
Type of mark: Figurative
Vienna Classification: 25.5.99, 29.1.8, 29.1.98 (Vienna Classification)
Acquired distinctiveness: No
Status of trade mark: Application under examination (Glossary)

- Absolute grounds examination
- Classification examination
- Searches

(History of statuses)

Filing language: Portuguese
Second language: English
National search requested: No

Graphic representation

Spotrisk

List of goods and services

Nice Classification: 35

Nice Classification: 42

Description

Description of the mark: -

Owner

Name: WS-ENERGIA LDA
ID No: 406689
Natural or legal person: Legal entity
Address: Taguspark Edificio Tecnologia II, 46
Post code: 2740-257
Town: Porto Salvo
Country: PORTUGAL
Correspondence address: WS-ENERGIA LDA Taguspark Edificio Tecnologia II, 46 P-2740-257 Porto Salvo PORTUGAL
Telephone: 00 351-214212190
Fax: 00 351-214212190

Appendix VI

Copyright form via national (Portuguese) trade mark registration in *Instituto Nacional de Propriedade Intelectual*.

inpi instituto nacional da propriedade industrial

MARCA NACIONAL Nº 510622

Síntese do Processo

Nº do Pedido	1000014980
Data de Apresentação	25-02-2013
Data do Pedido	25-02-2013
Tipo de Modalidade	NÃO APLICÁVEL A ESTA MODALIDADE
Fase Actual	PEDIDO-AGUARDA OPOSIÇÃO
Data de Início da Fase	18-03-2013
Data de Fim Previsto	20-05-2013
Situação de Taxas	PAGAMENTO NÃO-APLICÁVEL
Data de Início da Sit.	25-02-2013
Data de Fim Previsto da Sit.	---
Taxas Pagas	0
Taxas Devidas	0
Data da Última DIU	---
BPI 1ª Publicação	18-03-2013
Data do Despacho	---
BPI do Despacho	---
Data de Início de Vigência	---
Data Limite de Vigência	---
Titulares	WS ENERGIA, S.A.
Mandatário	---
Classificação de Nice	35 42
Processo em Tribunal	NÃO
Tribunal	---
Data de Envio	---

Spotrisk

SPOTRISK

Tipo de Sinal: MISTO

Classificação de Nice

Edição 9

Classe	Produtos/Serviços
35	SERVIÇOS DE INFORMAÇÃO, CONSULTORIA E ASSESSORIA EM MATÉRIA DE GESTÃO COMERCIAL E ADMINISTRAÇÃO COMERCIAL DISPONIBILIZADOS ON-LINE OU ATRAVÉS DA INTERNET.
42	CONSULTORIA TÉCNICA EM MATÉRIA DE DESENVOLVIMENTO DE PRODUTOS.

Fases Jurídicas

Fase	Data de Início	Data de Fim Previsto	Data de Fim Efectiva	Boletim	Entidade
05000000 - PEDIDO-APRESENTADO NO INPI	25-02-2013	---	27-02-2013	---	---
05110000 - PEDIDO-P/EXAME FORMAL (NORMAL)	27-02-2013	---	13-03-2013	---	---
05123000 - PEDIDO-PUB.REGULAR (C/OFÍCIO)	13-03-2013	18-03-2013	18-03-2013	18-03-2013	---
05123108 - OFÍCIO- DOCUMENTOS EXIGÍVEIS	13-03-2013	15-04-2013	18-03-2013	---	2358486
05140000 - PEDIDO-OPOSIÇÃO POSSÍVEL	18-03-2013	20-05-2013	---	---	---

Taxas Periódicas

Situações de Taxas

Situação	Data de Início	Data de Fim Previsto	Data de Fim Efectiva	Boletim
05T00000 - PAGAMENTO NÃO-APLICÁVEL	25-02-2013	---	---	---

Nota: Não existem registos de taxas efectivamente pagas em PT.

Entidades Intervenientes

Entidade	Nome	Morada	Localidade	Intervenção	Data de Início	Data de Fim
2358486	WS ENERGIA, S.A.	TAGUSPARK, EDIFÍCIO TECNOLOGIA II, PAV. 46	2740-257 PORTO SALVO - PORTUGAL	REQ./TITULAR	25-02-2013	---

Documentos Relacionados

Número	Data de Entrada	Acto Requerido	Requerente	Acto Executado	Data de Execução	Despacho
1000014980	25-02-2013 às 17:51:20	0599 - PEDIDO DE MARCA NACIONAL	WS-ENERGIA, S.A.	050001 - INCLUSÃO DE PEDIDO PENDENTE	27-02-2013	DEFERIDO

Boletins Relacionados

Boletim	Motivo de Publicação	Situação do Boletim	Nº do Documento	Texto
18-03-2013	02 - PUBLICAÇÃO DE PEDIDOS	PUBLICADO (BPI JÁ PUBLICADO)	---	---

Prioridades

Nota: Não existem registos de prioridades.

Países Designados

Nota: Não aplicável a esta modalidade.

Classificação de Viena

Classe	Descrição
25.5.94	FUNDOS, EM LETRAS OU NÚMEROS, DIVIDIDOS EM DOIS, NO SENTIDO VERTICAL

Appendix VII

Communication between Spotrisk's modules and the database – *Risk Matrix; Risk Factor; Risk Class* – and existing functionalities.

The communication with the database is performed along three different steps, specifically: the categorization of the User's Ratings into Risk Factors of each parameter; the classification of Risk Factors into Risk Classes of each goal; and finally the clustering of Risk Classes onto an overall Risk Factor (R) with any value from 1 to 5, as exposed on the Table VII.1.

Table VII.1 Communication between each module from database

User's Rating	Risk Factor	Risk Class	Risk Profile
1	*	*F*	*R*
2		*H*	
3	*m*	*M*	
4	*0*	*L*	
5		*S*	

Each parameter response given by the user represents in the database a quantity to be applied in the Risk Profile analyzes, which is first converted into a Risk Factor, where in the first two variables (Level of implementation and Capacity to influence) is proportional to its numerical display, being that they behave according to a "the higher, the lower risk" logic, as said before. Contrary to the third variable (Severity of the consequences), which behaves in the opposite manner, due to the fact that this parameter designates a significant weight on the assessed goal, in which the higher is the rate the bigger the impact is, on a potential risk basis. Thus the categorization of the User's Ratings into Risk Factors of each parameter is made according to the following Table VII.2.

Table VII.2 Categorization of ratings into Risk Factors.

Level of implementation Rating		Risk Factor	Capacity to influence Rating		Risk Factor	Severity of the consequences Rating		Risk Factor
1	↔	*	1	↔	*	1	↔	0
2	↔	*	2	↔	*	2	↔	0
3	↔	m	3	↔	m	3	↔	m
4	↔	0	4	↔	0	4	↔	*
5	↔	0	5	↔	0	5	↔	*

After each parameter is categorized according to Risk Factors, it is then performed the classification of Risk Factors into Risk Classes of each goal, meaning that each goal obtains a certain class in accordance with the existing Risk Factors. For instance, if the user simply answers to a certain goal within ratings of – 1; 1; 5 – regarding Level of implementation, Capacity

to influence and Severity of the consequences respectively, then the risk factors will be – *; *; * – and thus the Risk Class will be none but “F”, representative of Failure.

Nonetheless there are several possible combinations of Risk Classes according to the different Risk Factors attained in the database, similarly to RDM method where there were four possible Risk Factors instead of three, in which an additional variable “?” was accountable and thus 64 different combinations were conceivable. Hence, in this method three variables are taking into account and consequently 27 different combinations are possible – 3 x 3 x 3 = 27, exposed on the Table VII.3.

Table VII.3 Representation of all possible combinations of Risk Classes according to Risk Factors.

Risk Class	**Parameter 1**	**Parameter 2**	**Parameter 3**
F	*	*	*
H	*	*	m
M	*	*	0
H	*	m	*
M	*	m	m
M	*	m	0
H	*	0	*
M	*	0	m
L	*	0	0
H	m	*	*
M	m	*	m
M	m	*	0
M	m	m	*
M	m	m	m
M	m	m	0
M	m	0	*
M	m	0	m
L	m	0	0
M	0	*	*
M	0	*	m
L	0	*	0
M	0	m	*
M	0	m	m
L	0	m	0
L	0	0	*
L	0	0	m
S	0	0	0

After the information is inputted onto the database and the Risk Classes are attained, an overall Risk Profile is calculated. The platform presents two different forms of project Risk Profile evaluation within the results module: the Risk Profile per stage and the general project Risk Profile. The first one is made according to the answers given by the user only on a single stage, while the second one is the overall risk profile analysis with the answers given along the whole goals. In other words the Risk Profile can be exhibited according to each one of the completed answered stages or globally. The Risk Profile calculation is easily performed and corresponds to the average value of the goals included in the assessment, which can be described by the following equation:

$$Risk\ Profile\ (x) = \frac{\sum_{i=1}^{n} G_i}{n}$$

Consequently (x) represents one of the Risk Profile category assessments (stage or general), while G_i corresponds to the numerical value of the Risk Class from each goal and finally n represents the number of goals accountable, from a specific stage or from the whole four stages. Hereafter, the presented equation requires a numerical value for each goal's Risk Classes, which is represented by G_i. The Table VII.4 represents the conversion from Risk Classes into numerical values used to perform the Risk Profile analysis.

Table VII.4 Risk Classes/Numerical Conversion

Risk Class	Corresponding Value
S	1
L	2
M	3
H	4
F	5

For example, the Risk profile of the capability stage (which has 6 goals to be responded) of a certain *Project (X)* can be described by:

$$Risk\ Profile\ (Capability\ Stage\ Project\ (X)) = \frac{\sum_{i=1}^{n} G_i}{n}$$

Consequently let's imagine that a certain user rated the Capability Stage of a certain Project *(X)* as "5" in each parameter of every goal, being that it corresponds to "0", "0" and "*" in "Level of Implementation", "Capacity to Influence" and "Severity of the Consequences" parameters, respectively, for each and every 6 goals of the Capacity Stage. By observing table corresponding to the *Representation of all possible combinations of Risk Classes according to Risk Factors,* this combination of ratings matches the Risk Class of "L" (Low Risk) for every goal, which when conveyed into the table above corresponds then to the value of "2" to be used in the previous equation, for the group of 6 values of G_i. Therefore we have:

$G_i = \{2; 2; 2; 2; 2; 2\}$; With $n = 6$;

Hence we have

$$Risk\ Profile\left(Capability\ Stage\ Project\ (X)\right) = \frac{2+2+2+2+2+2}{6} = 2$$

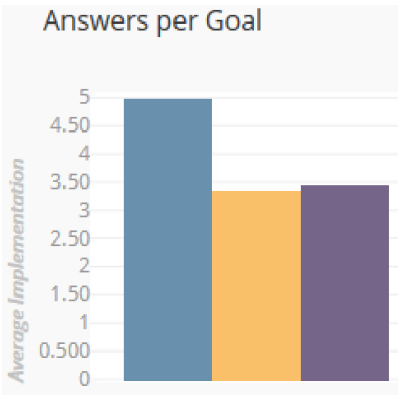
In this specific example “2” was obviously the expected value, since every goal had a Risk Class of “L” and thus “2”. Moreover, the Risk Profile analysis results on any numeric value between 1 and 5, being that it provides definite numeral intervals representative of a qualitative risk analysis, displayed on the Table VII.5.

Table VII.5 Numeral intervals representative of qualitative risk analysis.

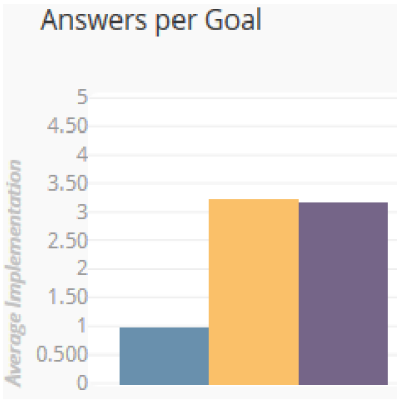
Interval	Risk Profile
1 ≤ Risk Profile ≤ 2	Safe
2 < Risk Profile ≤ 3	Viable
3 < Risk Profile ≤ 4	Risky
4 < Risk Profile ≤ 5	Impracticable

Appendix VIII

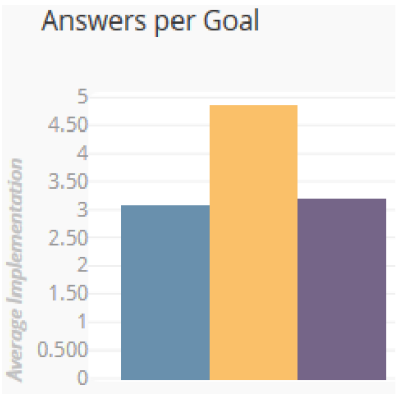
Module of comparative analysis.



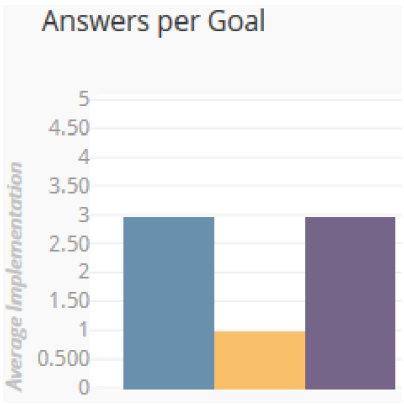
Confident



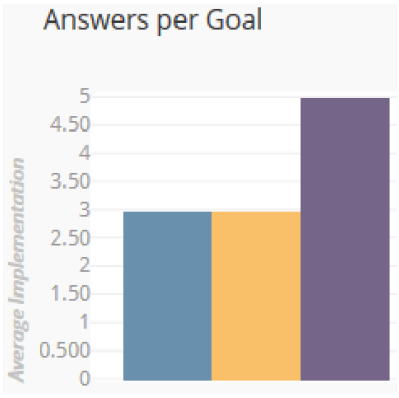
Insecure



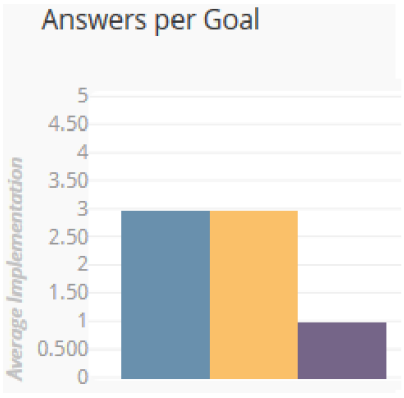
Controller



Out of Hand

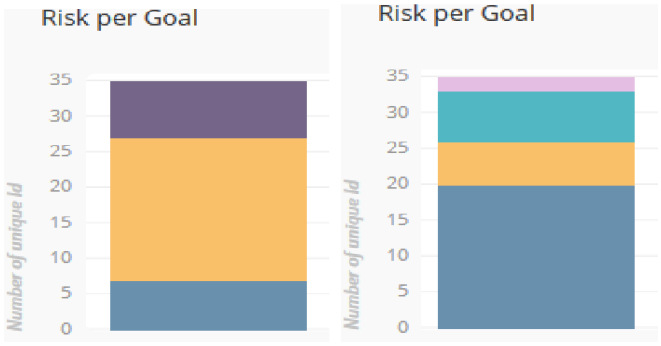


Protected

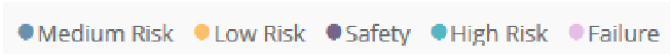


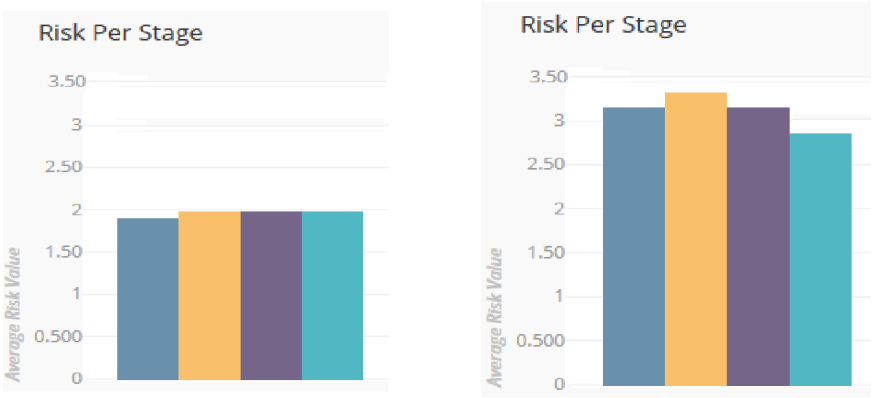
Vulnerable

Moreover, there can also be available on the database antagonist relations analysis concerning several variables, such as: the risk level assigned per each goal, the risk level assigned per each stage, or the advices generated per each goal, as illustrated in the following charts.

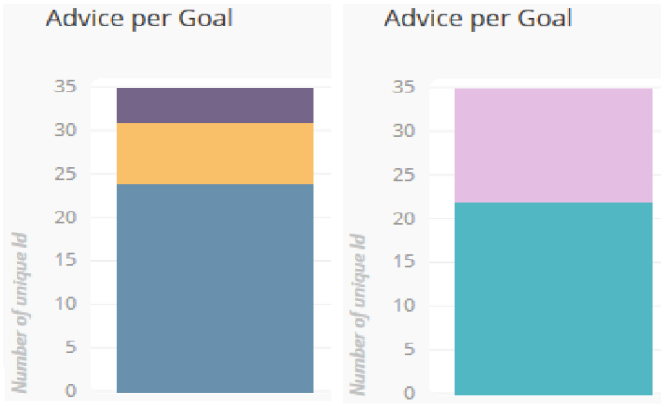


Confident insecure





Confident Insecure



Confident Insecure

Appendix IX

Table IX.1 Internal tests and assessments performed along 6 collaborators within WS Energia.

IDEA STAGE

GOAL 1	Goal 2	Goal 3	Goal 4	Goal 5	Goal 6	Goal 7	Goal 8	Goal 9	Goal 10	Goal 11	Goal 12
5	5	5	5	4	5	2	2	2	5	4	3
3	5	4	5	5	3	3	2	4	5	5	4
5	4	4	5	4	4	3	5	5	5	5	4
4	4	4	5	4	4	4	5	4	5	4	4
4	5	3	4	4	4	4	4	5	4	5	4
4	5	5	4	5	5	5	5	4	4	4	5
4,166667	4,666667	4,166667	4,666667	4,333333	4,166667	3,5	3,833333	4	4,666667	4,5	4

FEASIBILITY STAGE

GOAL 13	Goal 14	Goal 15	Goal 16	Goal 17	Goal 18	Goal 19	Goal 20	Goal 21
3	3	2	5	5	5	4	4	4
5	5	5	5	4	5	5	5	5
4	4	4	5	5	5	5	4	5
4	3	4	4	4	5	4	4	4
5	5	3	4	5	5	5	5	5
4	5	4	5	5	5	4	5	5
4,166667	4,166667	3,666667	4,666667	4,666667	5	4,5	4,5	4,666667

CAPABILITY STAGE

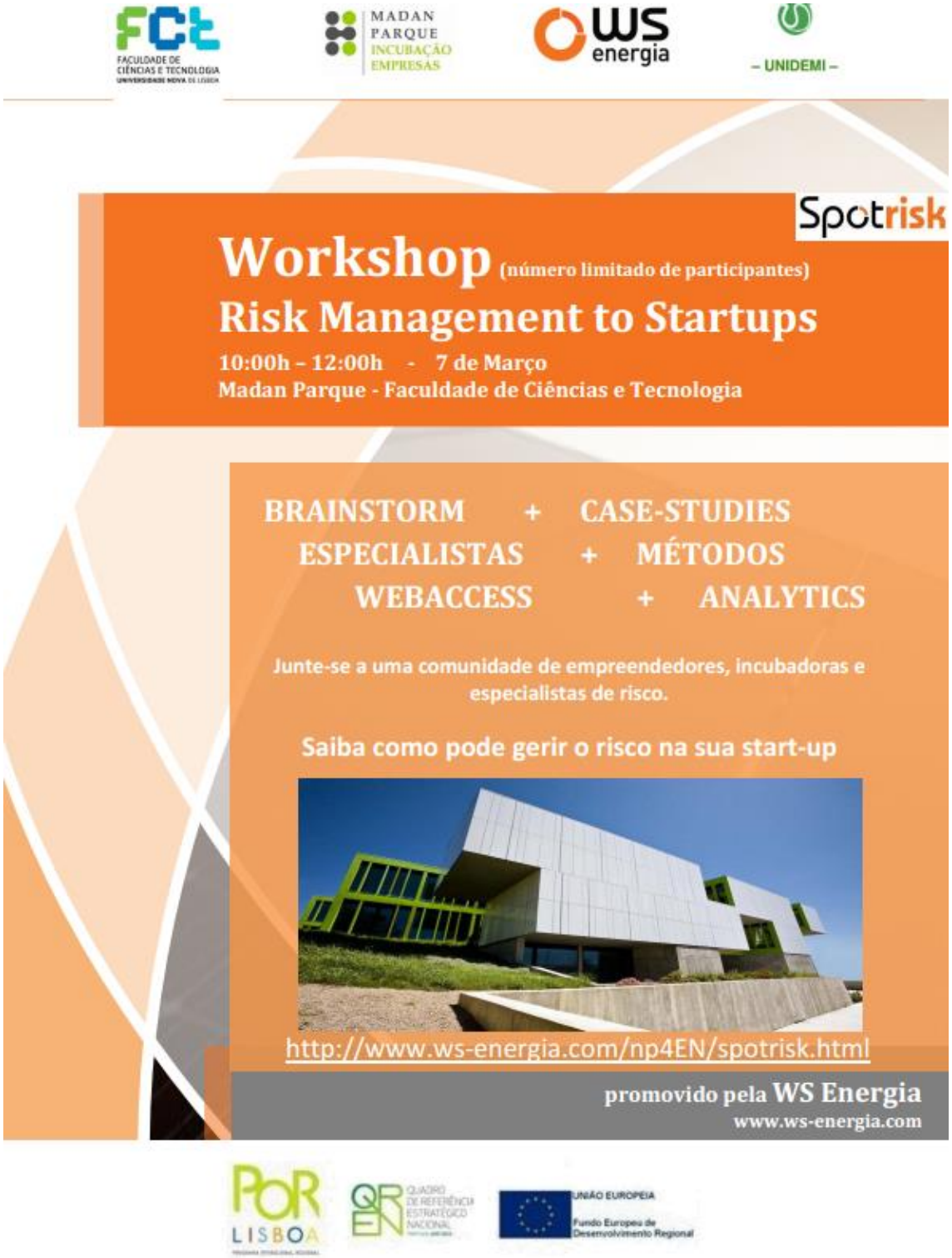
GOAL 22	Goal 23	Goal 24	Goal 25	Goal 26	Goal 27
5	3	5	3	5	3
2	5	5	5	5	5
4	5	4	5	4	4
4	4	4	5	4	3
5	4	5	5	5	5
4	5	4	4	5	4
4	4,333333	4,5	4,5	4,666667	4

LAUNCH STAGE

GOAL 28	Goal 29	Goal 30	Goal 31	Goal 32	Goal 33	Goal 34	Goal 35
5	3	5	3	4	4	3	4
4	5	2	5	3	2	5	3
5	4	3	4	4	5	3	3
5	2	3	4	4	5	4	5
5	5	3	5	4	3	5	4
4	4	5	4	4	4	4	5
4,666667	3,833333	3,5	4,166667	3,833333	3,833333	4	4

Appendix X

Agenda of the workshop performed in Madan Parque.



Programa

9:30h – 10:00h

Receção dos Participantes

10:00h – 10:30h

Sessão de Abertura - Brainstorming

Ph.D. João Wemans - Fundador WS Energia

- Por que razões pode o meu projeto falhar?
- Qual o meu receio principal?
- Que balanço fazer entre controlar e crescer?
- Qual o perfil de risco do meu projeto em relação à média?

10:30h – 11:00h

Testemunhos

Convidados

- Gestores de incubadoras
- Gestores de startups
- Especialistas internacionais de risco em grandes organizações

11:00h – 11:30h

Métodos de Gestão do Risco

Professora Alexandra Tenera – FCT-UNL

- A importância da gestão do risco desde uma fase inicial
- Metodologia para identificação e gestão do risco em projetos
- Aplicar métodos profissionais em pequenas empresas e equipas

11:30h – 12:00h

Apresentação da ferramenta Spotrisk®

Luís Pereira e João Bispo – FCT/UNL

- Os benefícios em usar uma ferramenta de gestão do risco
- Módulo de questionários e resultados simplificados
- Módulo de comparação entre projeto e evolução do meu projeto
- Exemplos de projetos já registados na plataforma

12:00h

Encerramento do Evento – Coffea Break/Networking

Appendix XI

Final survey concerning appreciations gendered over the Spotrisk's workshop.

Questionário Individual: Workshop de Gestão do Risco - um modelo web

Utilizador:

Nome: _____

Empresa: _____

Email: _____

Contacto Telefónico (opcional) : _____

Avaliação da Plataforma Spotrisk®

Classificação (marque com um x)	1 (Péssimo)	2	3	4	5 (Excelente)
Usabilidade					
Compreensão					
Visual					
Utilidade					
Geral					

Aspectos mais Positivos:

Sugestões:

Appendix XII

Table XII.1 Outcomes from the workshop's survey

Nome	Usabil.	Compr.	Visual	Util.	Geral	ASPECTOS POSITIVOS	SUGESTÕES
Participante 1	4	3	3	4	4	É relativamente intuitivo e as questões contribuem para uma análise crítica ao business plan. Tem grande potencialidade	Ser Bilingue. Reclamar a correspondência do interface nos resultados com a página onde estão as questões. Introduzir medidas de fiabilidade.
Participante 2	3	3	3	4	4	Informação sobre perspectiva a longo prazo do projecto é de grande utilidade. Análise competitiva com outros projectos da plataforma. Grande capacidade de evolução do site na evolução do risco.	Clarificar os parâmetros de resposta, nível de implementação, etc. Porque não são claros. Apresentar um resultado final conclusivo de todos os estágios, no sentido de uma aprovação ou reprovação do projecto. Ajudar na implementação do projecto, associando o spotrisk a outros sites com o fim de por exemplo o recrutamento de profissionais.
Participante 3	4	4	4	4	4	interfaces simples e atractivos. Intuitivo e sem complexidades desnecessárias. Gosto.	Ao nível dos interfaces podia haver um balão de ajuda que aparecia quando passávamos com o rato por cima de alguma variável. Devido às diferentes naturezas de cada projecto seria útil acrescentar uma ontologia de classes de projectos, em que cada classe prescreveria as questões que seriam mais relevantes para cada avaliação do risco. A apresentação dos resultados é feita de uma forma tabelar mas podia haver um módulo de geração de relatório com os resultados da avaliação e dando relevo aos aspectos mais importantes. Possibilidade de integrar este módulo como componente integrável num sistema de suporte a decisão (DSS) mais global. Por integrar entenda-se neste caso, que muitos dos inputs poderiam provir das outras componentes do DSS; o spotrisk por sua vez forneceria os resultados às outras componentes. Regressando ao interface, poderia haver a possibilidade de mostrar todos os resultados de todas as stages numa única matriz global, o que permitiria percepcionar a densidade/construção dos advices etc.

Table XII.1 (Cont.) Outcomes from the workshop's survey

Participante 4	3	4	3	4	3	Ajuda o utilizador a reflectir sobre os factores críticos para a gestão do projecto. Esse traço é exímio.	É difícil avaliar "capacity to influence" e "Severity of Consequences": o que se entende por severidade das consequências? Quais são as consequências? De não ter o goal fortemente implementado? A severidade é positiva ou negativa? Possuo dificuldades. Melhorar o interface com o utilizador. As cores são muito pesadas!
Participante 5	4	4	5	4	4	Na minha opinião as questões são adequadas e a solução é compreensiva e útil.	Na minha opinião era interessante tentar identificar quem está a responder as questões. Seria também interessante e útil na análise final conseguirmos voltar à questão especifica e não ao conjunto das questões.
Participante 6	3	3	4	5	4	Obriga a pensar e relembrar aspectos importantes (crenças, ASAE, finanças). Ser interessante sugerir a outros que avaliem o nosso projecto, amigos familiares etc. As pessoas não sabem que precisam disto mas, depois desta sessão, todos vemos que precisamos!	Como posso saber/ter noção da serverity of the consequences? Na descrição do goal podia haver a opção de ter mais informação sobre este, às vezes não me é claro o que querem dizer. Os advices podiam ter maior explicação.
Participante 7	2	3	3	5	4	-	Comentário para cada resposta? Racional sources. Manter os headings visíveis para todas as perguntas. Mais user-friendly. Comentários ou help específicos em falta. Integração com ferramentas de project management
Participante 8	4	3	3	4	4	-	Considerar a avaliação dos projectos por área. Avaliação das equipas/perfil da equipa. Avaliação distinta a nível do produto, tecnologia, operações, pi.
Participante 9	2	4	4	5	4	Capacidade de análise/auto-análise. Capacidade comparativa (importante no establecmento de prioridades)	Incluir rácio PotencialProjeto/RiscoProjeto (opportunity vs threat) Parabéns

Table XII.1 (Cont.) Outcomes from the workshop's survey

Participante 10	3	3	4	5	3	Visibilidade; ferramenta "informadora"	Células preenchidas nos questionários devem-se distinguir das restantes. No preenchimento a linha de topo deve estar sempre visível
Participante 11	4	4	3	5	4	Listagem extensa de pontos relevantes a ter em conta na validação do projecto.	Criar uma tabela de critérios que permita reduzir a subjectividade na graduação de cada item. Ex: o que é high para mim pode ser very high para outra pessoa e medium para uma terceira. Preceder o preenchimento de uma avaliação do perfil de risco (averter/taker/neutral) de quem responde.
Participante 12	4	4	3	5	4	Parabéns!	As pessoas respondem face ao risco de maneiras diferentes, cuidado. Para que o risco seja o mais real possível é talvez boa ideia obter as respostas da equipa inteira e ir buscar algumas homogeneidades.
Participante 13	4	3	4	5	4	-	Poderá eventualmente haver integração da ferramenta com outras ferramentas da gestão de projecto, de forma a completar todo o processo.
Participante 14	4	4	3	5	4	-	-
Média	3,4	3,5	3,5	4,6	3,9		

Appendix XIII

Table XIII.1 Collected data of the results from designated case studies.

Participant	Goal	Parameter	Self-Assessment 1	Vignette 1	Vignette 2	Self-Assessment 2	Variation	I / O	Average of Variation/Goal	Average of I/0 /Goal	Anchored Value	Tendency after reading Vignettes
1	S01 - G01 Idea Stage : Value Proposition	Level of Implementation	2	3	2	3	1	1	1,666666667	1	Deviated	Deviated
		Capacity to Influence	4	4	2	2	2	1			Approached	Approached
		Severity of the Consequences	3	3	3	5	2	1				
	S03 - G04 Capability Stage: Finance	Level of Implementation	3	3	2	3	0	0	0,666666667	0,666666667	0	0
		Capacity to Influence	3	3	1	4	1	1			5	Deviated
		Severity of the Consequences	3	5	3	4	1	1				
	S02 - G05 Feasibility Stage: Marketing	Level of Implementation	2	4	2	2	0	0	1,333333333	0,666666667	0	0
		Capacity to Influence	2	2	1	4	2	1			5	Deviated
		Severity of the Consequences	3	5	2	5	2	1				
	S01 - G09 Idea Stage: Core Competences	Level of Implementation	2	3	2	3	1	1	0,666666667	0,666666667	Deviated	Deviated
		Capacity to Influence	2	3	2	3	1	1			Deviated	Deviated
		Severity of the Consequences	3	2	1	3	0	0				
	S04 - G03 Launch Stage: Competition	Level of Implementation	3	4	3	4	1	1	0,666666667	0,666666667	Deviated	Deviated
		Capacity to Influence	2	5	4	3	1	1			1	Deviated
		Severity of the Consequences	2	4	2	2	0	0				

Table XIII.1 (Cont.) Collected data of the results from designated case studies.

Participant	Goal	Parameter	Self-Assessment 1	Vignette 1	Vignette 2	Self-Assessment 2	Variation	I / O	Average/Goal	Average/Goal	Anchored Value	Tendency after reading Vignettes
2	**S01 - G01 Idea Stage : Value Proposition**	Level of Implementation	4	4	3	3	1	1	0,666666667	0,666666667	Approached	Approached
		Capacity to Influence	2	3	2	2	0	0			2	0
		Severity of the Consequences	2	3	2	3	1	1				
	S03 - G04 Capability Stage: Finance	Level of Implementation	5	5	3	4	1	1	1	0,666666667	Approached	Approached
		Capacity to Influence	4	4	1	2	2	1			Approached	Approached
		Severity of the Consequences	3	2	1	3	0	0				
	S02 - G05 Feasibility Stage: Marketing	Level of Implementation	4	4	2	3	1	1	1	1	Approached	Approached
		Capacity to Influence	2	3	2	3	1	1			Deviated	Deviated
		Severity of the Consequences	2	2	2	3	1	1				
	S01 - G09 Idea Stage: Core Competences	Level of Implementation	3	4	3	2	1	1	0,666666667	0,666666667	1	Approached
		Capacity to Influence	4	3	2	4	0	0			5	0
		Severity of the Consequences	2	4	3	3	1	1				
	S04 - G03 Launch Stage: Competition	Level of Implementation	4	5	2	4	2	1	0,666666667	0,333333333	0	0
		Capacity to Influence	4	4	3	3	0	0			2	Approached
		Severity of the Consequences	3	2	2	3	0	0				

Table XIII.1 (Cont.) Collected data of the results from designated case studies.

Participant	Goal	Parameter	Self-Assessment 1	Vignette 1	Vignette 2	Self-Assessment 2	Variation	I / O	Average/Goal	Average/Goal	Anchored Value	Tendency after reading Vignettes
3	**S01 - G01 Idea Stage : Value Proposition**	Level of Implementation	3	3	2	3	0	0	0,666666667	0,666666667	0	0
		Capacity to Influence	4	4	2	3	1	1			Approached	Approached
		Severity of the Consequences	1	3	3	2	1	1				
	S03 - G04 Capability Stage: Finance	Level of Implementation	5	5	4	3	2	1	1	0,666666667	1	Approached
		Capacity to Influence	4	4	3	4	0	0			0	0
		Severity of the Consequences	3	4	3	4	1	1				
	S02 - G05 Feasibility Stage: Marketing	Level of Implementation	5	5	3	4	1	1	0,333333333	0,333333333	Approached	Approached
		Capacity to Influence	4	5	4	4	0	0			0	0
		Severity of the Consequences	3	4	3	3	0	0				
	S01 - G09 Idea Stage: Core Competences	Level of Implementation	4	5	4	3	1	1	0,666666667	0,666666667	1	Approached
		Capacity to Influence	4	3	2	3	1	1			Approached	Approached
		Severity of the Consequences	3	2	3	3	0	0				
	S04 - G03 Launch Stage: Competition	Level of Implementation	4	5	2	3	1	1	0,666666667	0,666666667	Approached	Approached
		Capacity to Influence	3	4	2	3	0	0			3	0
		Severity of the Consequences	3	4	2	4	1	1				

Table XIII.1 (Cont.) Collected data of the results from designated case studies.

Participant	Goal	Parameter	Self-Assessment 1	Vignette 1	Vignette 2	Self-Assessment 2	Variation	I / O	Average/Goal	Average/Goal	Anchored Value	Tendency after reading Vignettes
4	**S01 - G01 Idea Stage : Value Proposition**	Level of Implementation	3	5	3	4	1	1	0,666666667	0,666666667	Deviated	Deviated
		Capacity to Influence	3	3	2	3	0	0			4	0
		Severity of the Consequences	2	2	3	3	1	1				
	S03 - G04 Capability Stage: Finance	Level of Implementation	3	2	1	4	1	1	0,666666667	0,666666667	5	Deviated
		Capacity to Influence	3	3	2	3	0	0			4	0
		Severity of the Consequences	3	4	3	4	1	1				
	S02 - G05 Feasibility Stage: Marketing	Level of Implementation	3	5	2	5	2	1	1,333333333	0,666666667	Deviated	Deviated
		Capacity to Influence	2	3	1	4	2	1			5	Deviated
		Severity of the Consequences	2	5	4	2	0	0				
	S01 - G09 Idea Stage: Core Competences	Level of Implementation	3	4	2	5	2	1	2	1	5	Deviated
		Capacity to Influence	3	3	2	1	2	1			1	Approached
		Severity of the Consequences	3	4	3	5	2	1				
	S04 - G03 Launch Stage: Competition	Level of Implementation	3	4	3	3	0	0	1	0,666666667	2	0
		Capacity to Influence	1	4	2	2	1	1			Deviated	Deviated
		Severity of the Consequences	5	5	4	3	2	1				

Table XIII.1 (Cont.) Collected data of the results from designated case studies.

Participant	Goal	Parameter	Self-Assessment 1	Vignette 1	Vignette 2	Self-Assessment 2	Variation	I / O	Average/Goal	Average/Goal	Anchored Value	Tendency after reading Vignettes
5	**S01 - G01 Idea Stage : Value Proposition**	Level of Implementation	4	3	2	2	2	1	1	0,666666667	Approached	Approached
		Capacity to Influence	1	3	2	1	0	0			1	0
		Severity of the Consequences	4	1	3	3	1	1				
	S03 - G04 Capability Stage: Finance	Level of Implementation	5	3	2	4	1	1	1,333333333	1	5	Approached
		Capacity to Influence	3	3	2	1	2	1			1	Approached
		Severity of the Consequences	3	3	4	2	1	1				
	S02 - G05 Feasibility Stage: Marketing	Level of Implementation	2	1	2	2	0	0	1,333333333	0,666666667	0	0
		Capacity to Influence	1	5	4	3	2	1			1	Deviated
		Severity of the Consequences	5	2	1	3	2	1				
	S01 - G09 Idea Stage: Core Competences	Level of Implementation	2	3	1	2	0	0	0	0	0	0
		Capacity to Influence	3	2	1	3	0	0			5	0
		Severity of the Consequences	3	5	5	3	0	0				
	S04 - G03 Launch Stage: Competition	Level of Implementation	4	5	2	1	3	1	1,666666667	1	1	Approached
		Capacity to Influence	4	3	2	3	1	1			Approached	Approached
		Severity of the Consequences	4	4	3	3	1	1				

Table XIII.1 (Cont.) Collected data of the results from designated case studies.

Participant	Goal	Parameter	Self-Assessment 1	Vignette 1	Vignette 2	Self-Assessment 2	Variation	I / O	Average/Goal	Average/Goal	Anchored Value	Tendency after reading Vignettes
6	**S01 - G01 Idea Stage : Value Proposition**	Level of Implementation	3	4	3	5	2	1	1	0,666666667	5	Deviated
		Capacity to Influence	1	3	2	1	0	0			1	0
		Severity of the Consequences	1	1	3	2	1	1				
	S03 - G04 Capability Stage: Finance	Level of Implementation	1	3	1	1	0	0	1	0,666666667	0	0
		Capacity to Influence	1	3	2	3	2	1			4	Deviated
		Severity of the Consequences	4	2	3	3	1	1				
	S02 - G05 Feasibility Stage: Marketing	Level of Implementation	1	2	3	2	1	1	1	0,666666667	Deviated	Deviated
		Capacity to Influence	2	3	2	2	0	0			0	0
		Severity of the Consequences	4	3	5	2	2	1				
	S01 - G09 Idea Stage: Core Competences	Level of Implementation	3	2	1	3	0	0	0,666666667	0,333333333	5	0
		Capacity to Influence	2	2	1	4	2	1			5	Deviated
		Severity of the Consequences	3	2	2	3	0	0				
	S04 - G03 Launch Stage: Competition	Level of Implementation	3	5	2	4	1	1	0,333333333	0,333333333	Deviated	Deviated
		Capacity to Influence	3	5	3	3	0	0			0	0
		Severity of the Consequences	3	3	2	3	0	0				

Table XIII.1 (Cont.) Collected data of the results from designated case studies.

Participant	Goal	Parameter	Self-Assessment 1	Vignette 1	Vignette 2	Self-Assessment 2	Variation	I / O	Average/Goal	Average/Goal	Anchored Value	Tendency after reading Vignettes
7	S01 - G01 Idea Stage : Value Proposition	Level of Implementation	2	2	1	3	1	1	1	0,666666667	5	Deviated
		Capacity to Influence	3	3	2	3	0	0			4	0
		Severity of the Consequences	4	2	3	2	2	1				
	S03 - G04 Capability Stage: Finance	Level of Implementation	5	5	1	4	1	1	0,333333333	0,333333333	Approached	Approached
		Capacity to Influence	4	5	4	4	0	0			1	0
		Severity of the Consequences	3	2	2	3	0	0				
	S02 - G05 Feasibility Stage: Marketing	Level of Implementation	1	3	3	2	1	1	0,333333333	0,333333333	1	Deviated
		Capacity to Influence	2	5	2	2	0	0			0	0
		Severity of the Consequences	3	5	4	3	0	0				
	S01 - G09 Idea Stage: Core Competences	Level of Implementation	3	4	3	3	0	0	1	0,666666667	0	0
		Capacity to Influence	5	4	5	3	2	1			1	Approached
		Severity of the Consequences	1	3	4	2	1	1				
	S04 - G03 Launch Stage: Competition	Level of Implementation	5	5	1	3	2	1	0,666666667	0,333333333	Approached	Approached
		Capacity to Influence	3	2	2	3	0	0			5	0
		Severity of the Consequences	3	4	3	3	0	0				

Table XIII.1 (Cont.) Collected data of the results from designated case studies.

Participant	Goal	Parameter	Self-Assessment 1	Vignette 1	Vignette 2	Self-Assessment 2	Variation	I / O	Average/Goal	Average/Goal	Anchored Value	Tendency after reading Vignettes
8	**S01 - G01 Idea Stage : Value Proposition**	Level of Implementation	3	4	3	4	1	1	1	1	Deviated	Deviated
		Capacity to Influence	2	2	1	3	1	1			5	Deviated
		Severity of the Consequences	3	5	4	4	1	1				
	S03 - G04 Capability Stage: Finance	Level of Implementation	1	2	2	1	0	0	1,333333333	0,666666667	1	0
		Capacity to Influence	4	4	1	3	1	1			Approached	Approached
		Severity of the Consequences	5	2	3	2	3	1				
	S02 - G05 Feasibility Stage: Marketing	Level of Implementation	1	5	4	1	0	0	0,333333333	0,333333333	1	0
		Capacity to Influence	1	4	2	2	1	1			Deviated	Deviated
		Severity of the Consequences	2	3	4	2	0	0				
	S01 - G09 Idea Stage: Core Competences	Level of Implementation	1	3	2	2	1	1	1	0,666666667	Deviated	Deviated
		Capacity to Influence	2	3	2	2	0	0			0	0
		Severity of the Consequences	1	3	3	3	2	1				
	S04 - G03 Launch Stage: Competition	Level of Implementation	2	2	1	3	1	1	1,333333333	0,666666667	5	Deviated
		Capacity to Influence	2	2	1	5	3	1			5	Deviated
		Severity of the Consequences	4	4	3	4	0	0				

Table XIII.1 (Cont.) Collected data of the results from designated case studies.

Participant	Goal	Parameter	Self-Assessment 1	Vignette 1	Vignette 2	Self-Assessment 2	Variation	I / O	Average/Goal	Average/Goal	Anchored Value	Tendency after reading Vignettes
9	**S01 - G01 Idea Stage : Value Proposition**	Level of Implementation	5	3	3	4	1	1	0,333333333	0,333333333	5	Approached
		Capacity to Influence	3	5	3	3	0	0			0	0
		Severity of the Consequences	3	3	3	3	0	0				
	S03 - G04 Capability Stage: Finance	Level of Implementation	3	3	1	3	0	0	0,666666667	0,666666667	0	0
		Capacity to Influence	2	5	4	3	1	1			1	Deviated
		Severity of the Consequences	3	1	2	2	1	1				
	S02 - G05 Feasibility Stage: Marketing	Level of Implementation	5	4	1	3	2	1	0,666666667	0,333333333	Approached	Approached
		Capacity to Influence	2	2	1	2	0	0			0	0
		Severity of the Consequences	2	3	4	2	0	0				
	S01 - G09 Idea Stage: Core Competences	Level of Implementation	3	4	2	2	1	1	0,666666667	0,666666667	Approached	Approached
		Capacity to Influence	5	5	3	4	1	1			Approached	Approached
		Severity of the Consequences	2	3	3	2	0	0				
	S04 - G03 Launch Stage: Competition	Level of Implementation	3	3	1	3	0	0	0,666666667	0,666666667	0	0
		Capacity to Influence	3	2	1	2	1	1			Approached	Approached
		Severity of the Consequences	4	3	3	3	1	1				

Table XIII.1 (Cont.) Collected data of the results from designated case studies.

Participant	Goal	Parameter	Self-Assessment 1	Vignette 1	Vignette 2	Self-Assessment 2	Variation	I / O	Average/Goal	Average/Goal	Anchored Value	Tendency after reading Vignettes
10	**S01 - G01 Idea Stage : Value Proposition**	Level of Implementation	4	2	1	2	2	1	1,333333333	0,666666667	Approached	Approached
		Capacity to Influence	5	1	2	3	2	1			5	Approached
		Severity of the Consequences	1	3	4	1	0	0				
	S03 - G04 Capability Stage: Finance	Level of Implementation	4	3	1	4	0	0	0	0	5	0
		Capacity to Influence	4	3	2	4	0	0			5	0
		Severity of the Consequences	1	2	1	1	0	0				
	S02 - G05 Feasibility Stage: Marketing	Level of Implementation	4	3	2	3	1	1	0,666666667	0,666666667	Approached	Approached
		Capacity to Influence	4	2	1	4	0	0			5	0
		Severity of the Consequences	4	3	3	3	1	1				
	S01 - G09 Idea Stage: Core Competences	Level of Implementation	4	3	2	3	1	1	0,333333333	0,333333333	Approached	Approached
		Capacity to Influence	2	3	2	2	0	0			0	0
		Severity of the Consequences	3	4	4	3	0	0				
	S04 - G03 Launch Stage: Competition	Level of Implementation	2	2	1	3	1	1	0,666666667	0,666666667	5	Deviated
		Capacity to Influence	3	2	1	3	0	0			5	0
		Severity of the Consequences	4	3	2	3	1	1				

Table XIII.1 (Cont.) Collected data of the results from designated case studies.

Participant	Goal	Parameter	Self-Assessment 1	Vignette 1	Vignette 2	Self-Assessment 2	Variation	I / O	Average/Goal	Average/Goal	Anchored Value	Tendency after reading Vignettes
11	**S01 - G01 Idea Stage : Value Proposition**	Level of Implementation	5	5	4	4	1	1	1,333333333	1	Approached	Approached
		Capacity to Influence	3	3	3	5	2	1			5	Deviated
		Severity of the Consequences	1	1	1	2	1	1				
	S03 - G04 Capability Stage: Finance	Level of Implementation	4	4	2	4	0	0	1	0,666666667	0	0
		Capacity to Influence	3	2	1	5	2	1			5	Deviated
		Severity of the Consequences	2	3	5	3	1	1				
	S02 - G05 Feasibility Stage: Marketing	Level of Implementation	1	2	1	2	1	1	0,333333333	0,333333333	Deviated	Deviated
		Capacity to Influence	4	5	2	4	0	0			0	0
		Severity of the Consequences	2	4	3	2	0	0				
	S01 - G09 Idea Stage: Core Competences	Level of Implementation	2	1	1	2	0	0	1	0,666666667	5	0
		Capacity to Influence	3	5	3	5	2	1			Deviated	Deviated
		Severity of the Consequences	3	4	2	2	1	1				
	S04 - G03 Launch Stage: Competition	Level of Implementation	2	2	2	4	2	1	0,666666667	0,333333333	5	Deviated
		Capacity to Influence	2	2	1	2	0	0			0	0
		Severity of the Consequences	2	2	2	2	0	0				

Table XIII.1 (Cont.) Collected data of the results from designated case studies.

Participant	Goal	Parameter	Self-Assessment 1	Vignette 1	Vignette 2	Self-Assessment 2	Variation	I / O	Average/Goal	Average/Goal	Anchored Value	Tendency after reading Vignettes
12	**S01 - G01 Idea Stage : Value Proposition**	Level of Implementation	4	4	2	4	0	0	0	0	0	0
		Capacity to Influence	3	5	1	3	0	0			0	0
		Severity of the Consequences	1	3	2	1	0	0				
	S03 - G04 Capability Stage: Finance	Level of Implementation	1	3	2	2	1	1	1	1	Deviated	Deviated
		Capacity to Influence	2	5	4	3	1	1			1	Deviated
		Severity of the Consequences	2	3	1	1	1	1				
	S02 - G05 Feasibility Stage: Marketing	Level of Implementation	2	2	1	1	1	1	1	1	4	Approached
		Capacity to Influence	1	2	1	2	1	1			Deviated	Deviated
		Severity of the Consequences	4	3	3	3	1	1				
	S01 - G09 Idea Stage: Core Competences	Level of Implementation	3	4	1	3	0	0	1	0,666666667	0	0
		Capacity to Influence	1	2	1	2	1	1			Deviated	Deviated
		Severity of the Consequences	1	2	4	3	2	1				
	S04 - G03 Launch Stage: Competition	Level of Implementation	2	3	1	2	0	0	0,666666667	0,666666667	0	0
		Capacity to Influence	5	4	3	4	1	1			Approached	Approached
		Severity of the Consequences	4	2	3	3	1	1				

Table XIII.1 (Cont.) Collected data of the results from designated case studies.

Participant	Goal	Parameter	Self-Assessment 1	Vignette 1	Vignette 2	Self-Assessment 2	Variation	I / O	Average/Goal	Average/Goal	Anchored Value	Tendency after reading Vignettes
13	**S01 - G01 Idea Stage : Value Proposition**	Level of Implementation	3	5	1	4	1	1	1	1	Deviated	Deviated
		Capacity to Influence	5	3	1	4	1	1			5	Approached
		Severity of the Consequences	4	1	4	3	1	1				
	S03 - G04 Capability Stage: Finance	Level of Implementation	2	2	1	2	0	0	0,333333333	0,333333333	0	0
		Capacity to Influence	1	3	2	2	1	1			Deviated	Deviated
		Severity of the Consequences	3	2	2	3	0	0				
	S02 - G05 Feasibility Stage: Marketing	Level of Implementation	4	5	3	4	0	0	1,333333333	0,666666667	0	0
		Capacity to Influence	5	3	1	4	1	1			5	Approached
		Severity of the Consequences	5	1	1	2	3	1				
	S01 - G09 Idea Stage: Core Competences	Level of Implementation	5	2	5	3	2	1	1	0,666666667	Approached	Approached
		Capacity to Influence	3	3	2	3	0	0			0	0
		Severity of the Consequences	2	3	3	3	1	1				
	S04 - G03 Launch Stage: Competition	Level of Implementation	2	3	2	2	0	0	0,666666667	0,333333333	0	0
		Capacity to Influence	3	3	2	3	0	0			0	0
		Severity of the Consequences	5	4	2	3	2	1				

Table XIII.1 (Cont.) Collected data of the results from designated case studies.

Participant	Goal	Parameter	Self-Assessment 1	Vignette 1	Vignette 2	Self-Assessment 2	Variation	I / O	Average/Goal	Average/Goal	Anchored Value	Tendency after reading Vignettes
14	**S01 - G01 Idea Stage : Value Proposition**	Level of Implementation	3	4	2	3	0	0	0,666666667	0,666666667	0	0
		Capacity to Influence	5	2	2	4	1	1			5	Approached
		Severity of the Consequences	4	1	3	3	1	1				
	S03 - G04 Capability Stage: Finance	Level of Implementation	5	4	3	4	1	1	1,333333333			
		Capacity to Influence	2	3	2	2	0	0				
		Severity of the Consequences	5	1	1	2	3	1				
	S02 - G05 Feasibility Stage: Marketing	Level of Implementation	5	3	2	4	1	1	1	1	5	Approached
		Capacity to Influence	2	3	2	3	1	1			Deviated	Deviated
		Severity of the Consequences	5	2	2	4	1	1				
	S01 - G09 Idea Stage: Core Competences	Level of Implementation	4	5	1	4	0	0	0			
		Capacity to Influence	4	5	4	4	0	0				
		Severity of the Consequences	4	2	1	4	0	0				
	S04 - G03 Launch Stage: Competition	Level of Implementation	3	4	3	3	0	0	0,333333333	0,333333333	0	0
		Capacity to Influence	3	4	1	4	1	1			Deviated	Deviated
		Severity of the Consequences	3	4	2	3	0	0				

Table XIII.1 (Cont.) Collected data of the results from designated case studies.

Participant	Goal	Parameter	Self-Assessment 1	Vignette 1	Vignette 2	Self-Assessment 2	Variation	I / O	Average/Goal	Average/Goal	Anchored Value	Tendency after reading Vignettes
15	**S01 - G01 Idea Stage : Value Proposition**	Level of Implementation	2	3	1	4	2	1	1,333333333	1	5	Deviated
		Capacity to Influence	4	4	3	3	1	1			Approached	Approached
		Severity of the Consequences	2	2	3	3	1	1				
	S03 - G04 Capability Stage: Finance	Level of Implementation	5	5	2	4	1	1	0,666666667	0,666666667	Approached	Approached
		Capacity to Influence	4	4	1	3	1	1			Approached	Approached
		Severity of the Consequences	3	2	1	3	0	0				
	S02 - G05 Feasibility Stage: Marketing	Level of Implementation	1	2	2	4	3	1	1,333333333	0,666666667	5	Deviated
		Capacity to Influence	3	4	3	3	0	0			0	0
		Severity of the Consequences	3	4	3	4	1	1				
	S01 - G09 Idea Stage: Core Competences	Level of Implementation	2	3	3	2	0	0	1	0,666666667	1	0
		Capacity to Influence	4	3	2	3	1	1			Approached	Approached
		Severity of the Consequences	2	2	5	4	2	1				
	S04 - G03 Launch Stage: Competition	Level of Implementation	5	5	4	4	1	1	0,333333333	0,333333333	Approached	Approached
		Capacity to Influence	5	4	2	5	0	0			5	0
		Severity of the Consequences	2	5	1	2	0	0				

Table XIII.1 (Cont.) Collected data of the results from designated case studies.

Participant	Goal	Parameter	Self-Assessment 1	Vignette 1	Vignette 2	Self-Assessment 2	Variation	I / O	Average/Goal	Average/Goal	Anchored Value	Tendency after reading Vignettes
16 0	**S01 - G01 Idea Stage : Value Proposition**	Level of Implementation	5	4	1	2	3	1	1,333333333	0,666666667	Approached	Approached
		Capacity to Influence	2	2	1	2	0	0			0	0
		Severity of the Consequences	4	3	4	3	1	1				
	S03 - G04 Capability Stage: Finance	Level of Implementation	2	2	1	2	0	0	0,333333333	0,333333333	0	0
		Capacity to Influence	2	4	2	3	1	1			Deviated	Deviated
		Severity of the Consequences	3	4	3	3	0	0				
	S02 - G05 Feasibility Stage: Marketing	Level of Implementation	4	4	1	4	0	0	0	0	0	0
		Capacity to Influence	2	3	2	2	0	0			0	0
		Severity of the Consequences	3	4	3	3	0	0				
	S01 - G09 Idea Stage: Core Competences	Level of Implementation	5	5	2	4	1	1	0,666666667	0,666666667	Approached	Approached
		Capacity to Influence	4	3	2	4	0	0			5	0
		Severity of the Consequences	5	2	3	4	1	1				
	S04 - G03 Launch Stage: Competition	Level of Implementation	5	5	1	4	1	1	1,333333333	1	Approached	Approached
		Capacity to Influence	5	3	2	3	2	1			Approached	Approached
		Severity of the Consequences	4	3	3	3	1	1				

Table XIII.1 (Cont.) Collected data of the results from designated case studies.

Participant	Goal	Parameter	Self-Assessment 1	Vignette 1	Vignette 2	Self-Assessment 2	Variation	I / O	Average/Goal	Average/Goal	Anchored Value	Tendency after reading Vignettes
17	**S01 - G01 Idea Stage : Value Proposition**	Level of Implementation	5	4	3	4	1	1	1,333333333	1	Approached	Approached
		Capacity to Influence	1	3	2	3	2	1			Deviated	Deviated
		Severity of the Consequences	5	3	1	4	1	1				
	S03 - G04 Capability Stage: Finance	Level of Implementation	4	2	2	3	1	1	0,333333333	0,333333333	5	Approached
		Capacity to Influence	4	5	3	4	0	0			0	0
		Severity of the Consequences	2	2	3	2	0	0				
	S02 - G05 Feasibility Stage: Marketing	Level of Implementation	4	2	1	4	0	0	1	0,666666667	5	0
		Capacity to Influence	2	5	3	3	1	1			Deviated	Deviated
		Severity of the Consequences	5	2	1	3	2	1				
	S01 - G09 Idea Stage: Core Competences	Level of Implementation	2	4	3	3	1	1	1,333333333	1	Deviated	Deviated
		Capacity to Influence	1	1	1	2	1	1			5	Deviated
		Severity of the Consequences	1	3	3	3	2	1				
	S04 - G03 Launch Stage: Competition	Level of Implementation	4	5	2	4	0	0	0,333333333	0,333333333	0	0
		Capacity to Influence	4	4	1	4	0	0			0	0
		Severity of the Consequences	1	3	3	2	1	1				

Table XIII.1 (Cont.) Collected data of the results from designated case studies.

Participant	Goal	Parameter	Self-Assessment 1	Vignette 1	Vignette 2	Self-Assessment 2	Variation	I / O	Average/Goal	Average/Goal	Anchored Value	Tendency after reading Vignettes
18	**S01 - G01 Idea Stage : Value Proposition**	Level of Implementation	5	2	1	4	1	1	0,666666667	0,666666667	5	Approached
		Capacity to Influence	1	3	3	1	0	0			1	0
		Severity of the Consequences	3	5	5	4	1	1				
	S03 - G04 Capability Stage: Finance	Level of Implementation	4	4	2	3	1	1	0,333333333	0,333333333	Approached	Approached
		Capacity to Influence	4	3	2	4	0	0			5	0
		Severity of the Consequences	3	5	5	3	0	0				
	S02 - G05 Feasibility Stage: Marketing	Level of Implementation	2	3	1	3	1	1	1,666666667	1	Deviated	Deviated
		Capacity to Influence	5	5	3	3	2	1			Approached	Approached
		Severity of the Consequences	5	5	4	3	2	1				
	S01 - G09 Idea Stage: Core Competences	Level of Implementation	3	4	2	4	1	1	1	0,666666667	Deviated	Deviated
		Capacity to Influence	5	2	1	3	2	1			5	Approached
		Severity of the Consequences	3	4	5	3	0	0				
	S04 - G03 Launch Stage: Competition	Level of Implementation	2	4	2	2	0	0	1,333333333	0,666666667	0	0
		Capacity to Influence	4	3	2	2	2	1			Approached	Approached
		Severity of the Consequences	4	3	2	2	2	1				

Table XIII.1 (Cont.) Collected data of the results from designated case studies.

Participant	Goal	Parameter	Self-Assessment 1	Vignette 1	Vignette 2	Self-Assessment 2	Variation	I / O	Average/Goal	Average/Goal	Anchored Value	Tendency after reading Vignettes
19	**S01 - G01 Idea Stage : Value Proposition**	Level of Implementation	4	3	1	3	1	1	1,333333333	1	Approached	Approached
		Capacity to Influence	2	5	2	3	1	1			Deviated	Deviated
		Severity of the Consequences	1	5	4	3	2	1				
	S03 - G04 Capability Stage: Finance	Level of Implementation	2	5	3	4	2	1	1	0,666666667	Deviated	Deviated
		Capacity to Influence	2	2	2	3	1	1			5	Deviated
		Severity of the Consequences	2	3	2	2	0	0				
	S02 - G05 Feasibility Stage: Marketing	Level of Implementation	4	4	2	3	1	1	1	0,666666667	Approached	Approached
		Capacity to Influence	1	3	2	3	2	1			Deviated	Deviated
		Severity of the Consequences	2	4	3	2	0	0				
	S01 - G09 Idea Stage: Core Competences	Level of Implementation	4	3	3	4	0	0	0,666666667	0,333333333	5	0
		Capacity to Influence	1	4	2	3	2	1			Deviated	Deviated
		Severity of the Consequences	3	2	4	3	0	0				
	S04 - G03 Launch Stage: Competition	Level of Implementation	2	4	2	3	1	1	1	1	Deviated	Deviated
		Capacity to Influence	5	4	3	4	1	1			Approached	Approached
		Severity of the Consequences	2	3	2	3	1	1				